WIRE AND WIRE PRODUCTS

AUGUST 195

Efficient air cooling
permits the drawing
of all grades of wire
at high speed

MORGAN
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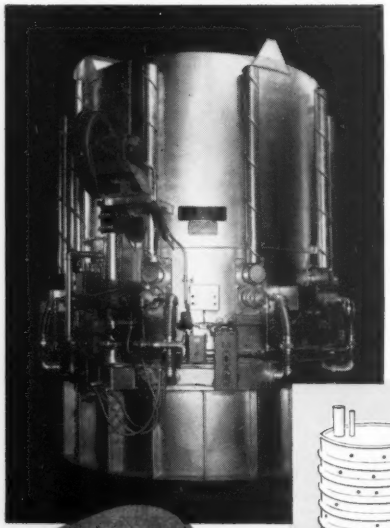
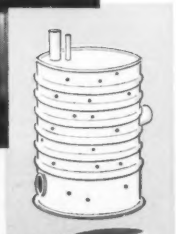
WIRE MACHINES

Morgan Construction C
WORCESTER, MASSACHUSETTS

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

20th year of annealing development





1953

1933

Twenty years ago penicillin, jet planes, radar control and atom bombs were unheard of . . . the nation was in the grip of its most disastrous depression and the steel business was practically at a standstill . . . yet, this was the time Lee Wilson chose to introduce his radiant tube annealing furnace. Steelmakers agreed that here was a great advancement in annealing practice, and as business picked up and steel came alive these steelmen adopted the Lee Wilson system. Constantly working to improve annealing processes, Lee Wilson, a few years later, announced a high convection method for annealing steel and again steel leaders approved.

Today Wilson Furnaces can be found in every leading steel making center the world over . . . and the new Wilson Single Stack Portable Base Furnace is an important topic of conversation whenever annealing is discussed.

In the past twenty years there have been many earth-shaking developments in practically every field of endeavor. To people interested in producing better steel, faster, at lower costs, the constantly new annealing processes of Lee Wilson have been a great part of this advancement.

Lee Wilson Engineering Co., Inc.

Cleveland, Ohio

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(ANSWER NUMBER 2)

ONE SOURCE FOR ALL TOOLING NEEDS

THE *RIGHT* STEEL OR CARBIDE . . . THE *EXACT* METALLURGICAL COMBINATION NEEDED TO DO YOUR JOB BEST . . . FROM A SINGLE MANUFACTURING SOURCE

The next time you have a difficult tooling problem we invite you to call in a Firth Sterling man.

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He can give you an unbiased recommendation . . . because he has approximately 100 different grades of Firth Sterling high speed steels, and tool and die steels to choose from *and* a dozen grades of tungsten carbide in everything from die nibs to a virtually unlimited variety of standard and special carbide cutting tools and tips.

All this is backed by 64 years of leadership in the development and production of special purpose steels, and 21 years of pioneering in carbide and "powder metallurgy" applications.

It makes sense, that a company which engages in *all* phases of tooling metallurgy will serve your interests best.

Remember, Firth Sterling *is* a single, dependable source for complete shop tooling.

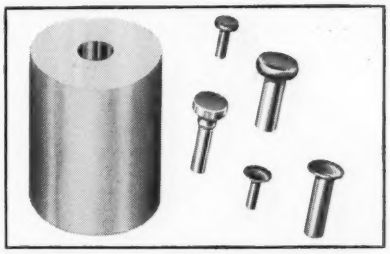
Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future

I-2

DIE SPECIALISTS to the WIRE INDUSTRY

A COMPLETE LINE . . . CARBIDE AND STEEL

Firth Sterling offers wire manufacturers and fabricators the advantages of a *single* source of supply of materials for both tungsten carbide and tool steel drawing, shaping, forming and heading dies. This *complete* line, from famous Firthaloy, for maximum performance where carbide is a requirement, through almost one hundred grades of high speed and tool steels for cut-off knives, roll guides, die casings,

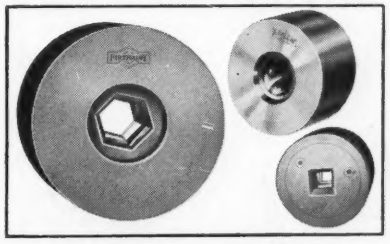


Carbide or steel heading dies—choose from the complete line which material best suits your needs.

forming rolls and similar applications, saves you time and money.

Standard items are available from warehouse stocks; others may be obtained from your local tool and diemaker.

Firth Sterling representatives are skilled in interpreting the needs of the wire industry and in suggesting the exactly right



Round, square, hex or specials—in carbide or steel as drawing requirements may indicate.

steel or carbide for specific applications. Because they know and sell both, you can depend on their unbiased recommendations to result in better, more economical tooling.

P-4

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— INC. —

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High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
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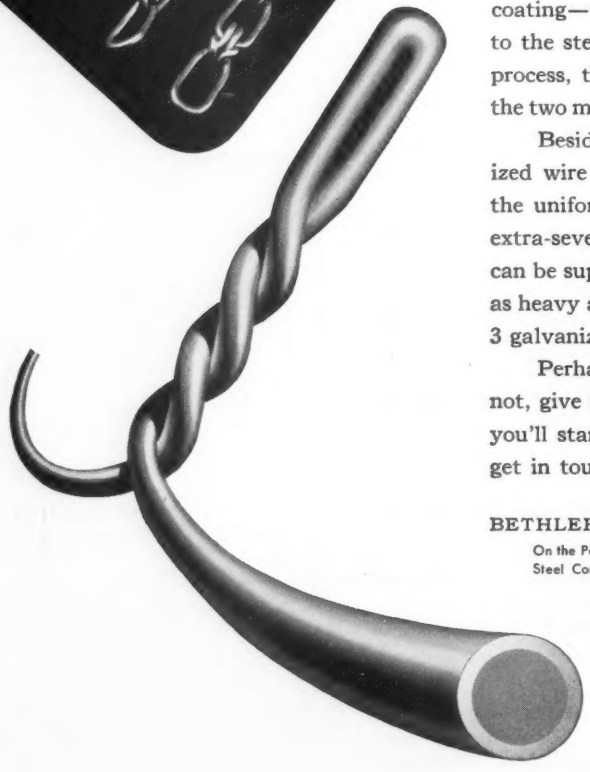
High Temperature Cermets

SEVERE FABRICATING JOBS

CAN'T HURT

BETHANIZED WIRE



Here's a zinc-coated wire that comes through the toughest fabricating operations with coating undamaged. Twist it, bend it, form it—even draw it to fine gage—and the zinc stays put on bethanized wire.

Bethanized wire works easily without flaking or peeling because of the remarkable ductility of the coating—99.9 pct pure zinc—and its tight adherence to the steel base. Applied by an advanced electrolytic process, the zinc is locked so tightly to the steel that the two metals—zinc and steel—become practically one.

Besides being able to take severe forming, bethanized wire has superior resistance to corrosion, due to the uniformity and purity of the coating. And where extra-severe corrosive conditions exist, bethanized wire can be supplied with a coating weight up to three times as heavy as the coatings specified in conventional Type 3 galvanizing.

Perhaps you're already using bethanized wire. If not, give it a tryout. Chances are you'll like it so well you'll standardize on it. For more information, please get in touch with the nearest Bethlehem office.

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STANDARD'S field men are all wire drawing *specialists,* equipped with that experience and knowledge of the practical side of wire drawing that enables men to render the competent service so sorely needed.

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In buying from STANDARD you can ask for and get that plus value called "SERVICE." This service will help you select the *right* compound for the wire to be drawn and the conditions under which you operate.

STANDARD'S specialists are ready and able to serve you.

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wire drawing lubricants

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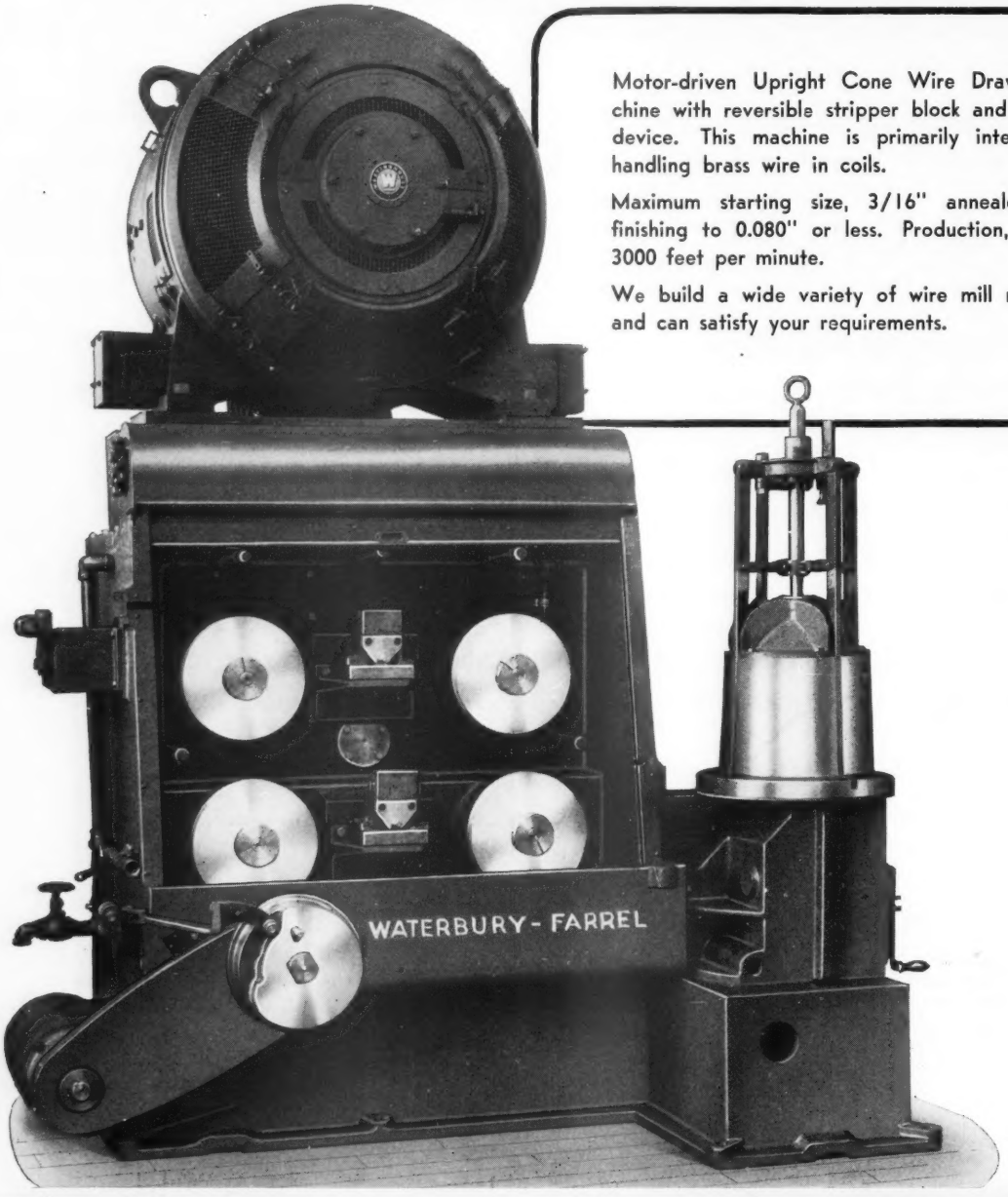
WIRE DRAWING MACHINES



Motor-driven Upright Cone Wire Drawing Machine with reversible stripper block and string-up device. This machine is primarily intended for handling brass wire in coils.

Maximum starting size, 3/16" annealed brass, finishing to 0.080" or less. Production, 1000 to 3000 feet per minute.

We build a wide variety of wire mill machinery and can satisfy your requirements.

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WIRE MILL EQUIPMENT—Continuous Wire Drawing Machines (Upright Cone and Tandem) • Wire Flattening Mills • Chain Draw Benches • Pointers • Swagers • Bull Blocks • String-up Machines • Spoolers, etc. *COLD PROCESS BOLT & NUT MACHINERY*—Headers (all types) • Rivet Machinery • Trimmers • Thread Rolling Machines • Slotters • Nut Formers and Tappers, etc. *POWER PRESSES*—Crank, Cam and Toggle; also Rack and Pinion Presses • Eyelet Machines • Multiple Plunger Presses • Horizontal and Hydraulic Presses, etc. *MILL MACHINERY*—Rolling Mills: Strip, Rod, Wire Flattening, (For Ferrous and Non Ferrous Metals) • Also Slitters • Straighteners • Cut-off Saws • Coilers • Winders, etc.

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WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 28 AUGUST, 1953 No. 8

Designated as Official Publication By The Wire Association

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WIRE and WIRE PRODUCTS is indexed regularly by Engineering Index, Inc., New York, N. Y.

RICHARD E. BROWN, President and Publisher

R. S. Spengel, Secy.-Treas. & Gen'l. Manager
J. Edward Donnellan, Vice-President

Edmund D. Sickels, Editor

— ASSOCIATE EDITORS —
Lancaster, Allwine & Rommel, Consultants on Patent Information

Publication Office: Jersey City, N. J.
Executive Office: 453 Main St., Stamford, Conn.
*Reg. U. S. Pat. Off.

WIRE & WIRE PRODUCTS, Vol. 28, No. 8, August, 1953. Publication Office at One Sherman Avenue, Jersey City, N. J. Executive Office 453 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy, except October Convention Issue and January Convention Proceedings Issue, $1.00 per copy; Foreign $7.50 per year. Entered as second class matter, at the Post Office, Jersey City, N. J., under the act of March 3, 1879.

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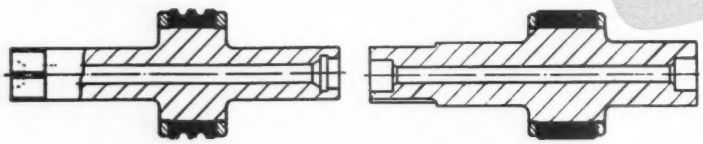

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Solid Talide Carbide Rolls are generally used for cold rolling carbon, alloy, spring, razor, silicon, stainless and other analyses of strip steel. They are being used satisfactorily as either idle or driven rolls. For cold rolling flat or shape wire from round wire, or when rolling metal tinsel or ribbon, a carbide sleeve is usually press fitted to a steel arbor. Talide Rolls can be produced in diameters up to 24" and lengths up to 40".

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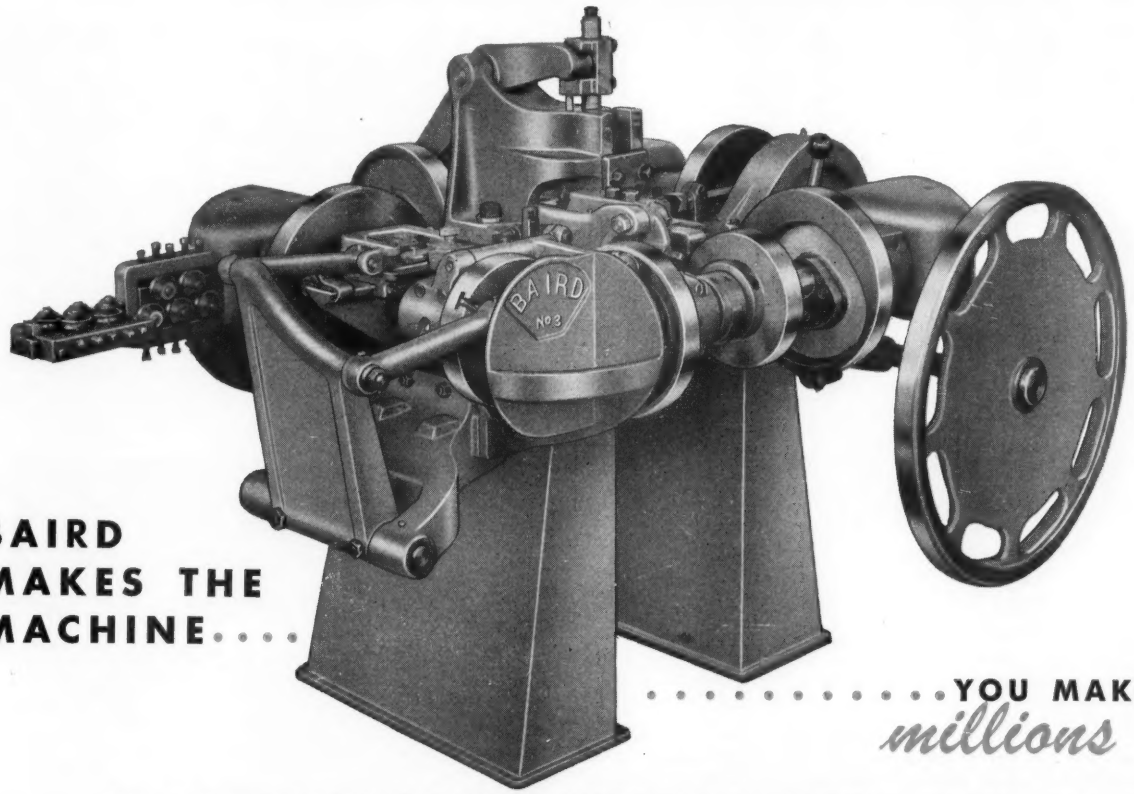

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The Baird automatic Four-Slide Machine produces an extremely wide variety of articles made of any commercial wire . . . round, half-round, square, or flat . . . at highest speeds. It takes coiled wire from a reel, straightens, feeds, and cuts off the required length . . . then forms and ejects the part produced. Eight sizes handle shorter wire lengths; three sizes take longer lengths to 32½".

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for faster, more uniform wire production,

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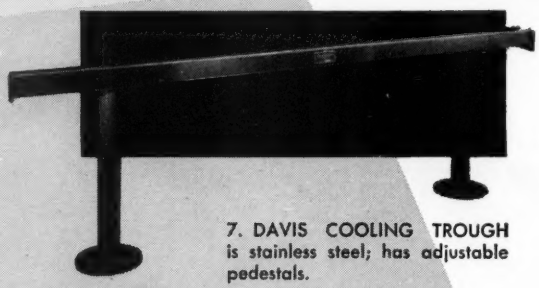

1. DAVIS PAY-OFF is simply yet ruggedly built for wide range of reel sizes. Constructed for long, dependable service, its automatic control prevents wire overtravel . . . stops when wind-up stops!

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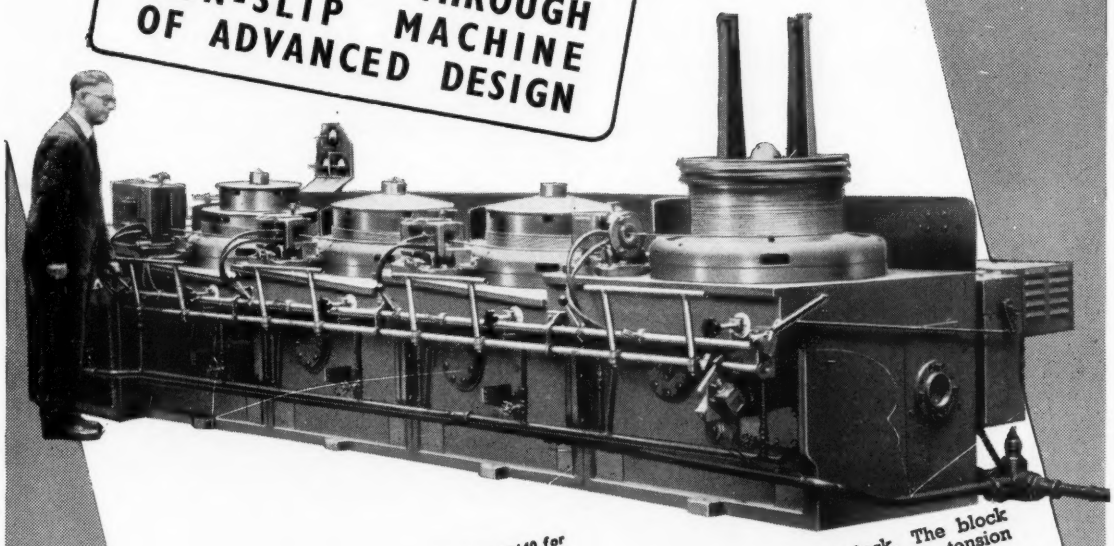

Special 4/5 Block Pathfinder Type 22/40 for drawing mild steel from 5 s.w.g. at speeds up to 2,250 feet per minute.

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Finish.	.250" — .102"
Drawing Speeds.	600—1200 feet per minute.

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MR-52

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"Always reliable!" . . . was the operator's remark about this wire-drawing machine which has continuously produced steel-wire for our customer every single working-day for 12 years.

We manufacture drawing machines for drawing wire from rod max. ¾" down to 0.005" diameter of any ordinary material — ferrous and non-ferrous metals — and fitted with one or several blocks. May we have your inquiry?

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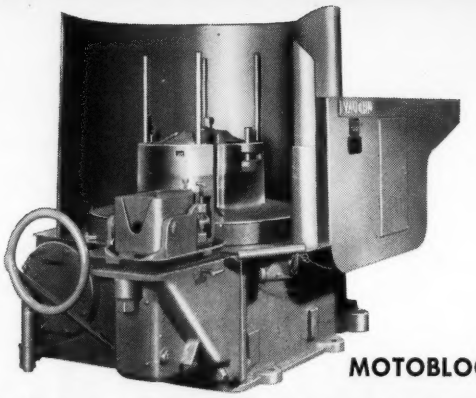

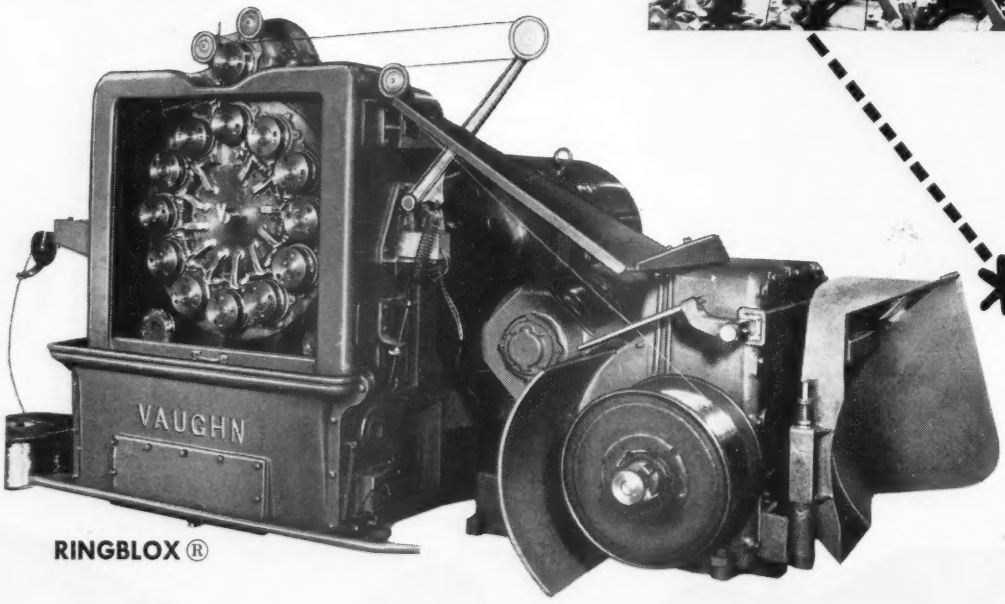

We're specialists in Cold Drawing Equipment. No other manufacturing interests divide our concentration—one of many good reasons for VAUGHN leadership in the field!

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Production perfection is *engineered* into Davis-Standard thermoplastic extruders to meet *your* specific problem. They are the *only* plastics extruders with these features:

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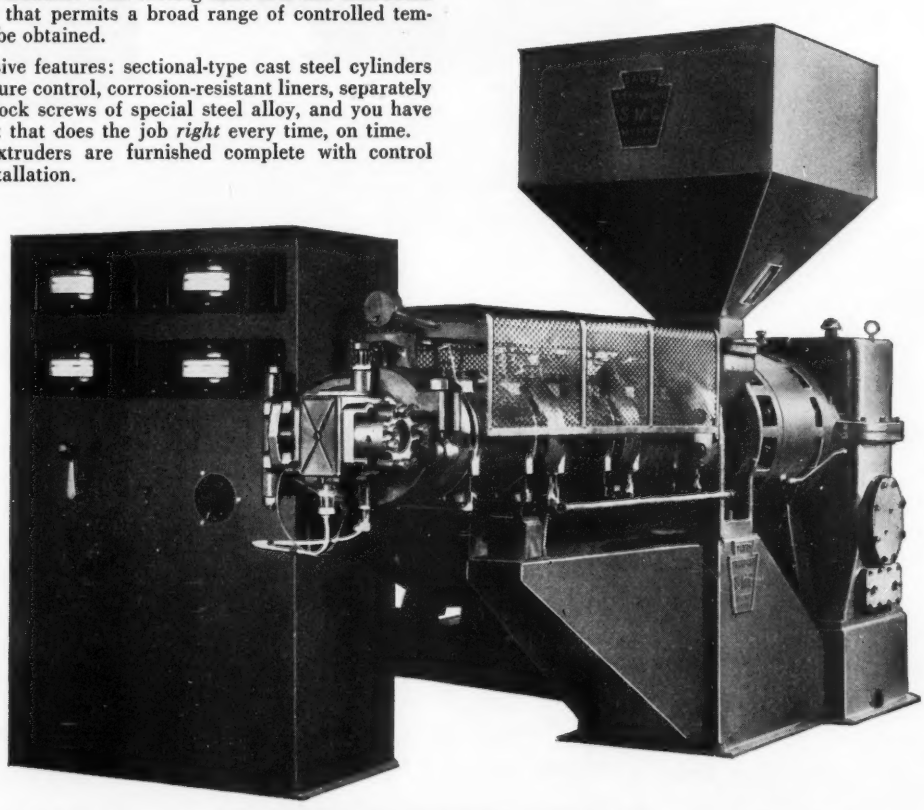
Davis-Standard extruders are furnished complete with control panel, ready for installation.



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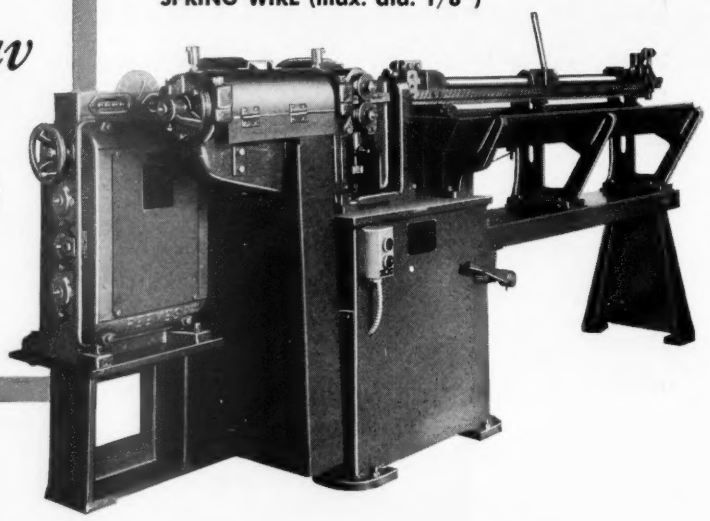
Automatic

WIRE STRAIGHTENING & CUTTING MACHINE

BASIC WIRE (3/32" to 1/4")

SPRING WIRE (max. dia. 1/8")



- **Geared to feed any speed from 50 to 200 feet per minute.**
- **Capacity 3/32" to ¼" dia. basic wire; to ⅛" Spring wire.**
- **Immediate selection of the r.p.m. best suited for the work and the needs of the operator.**
- **One machine to straighten and cut wire of different sizes, different alloys, different tempers.**
- **Once set, constant speed is maintained in spite of possible load variations.**
- **On-the-job-adjustment of speed to compensate for any variations in wire coil. Maximum productivity.**
- **Simple, economical operation. Trouble-free maintenance.**

There is a SHUSTER for every wire straightening and cutting job from .025 to 11/16" dia.

WRITE FOR BULLETIN No. 53

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Representatives in all principal cities and in foreign countries.

for a few pounds of copper... or a truckload... Call Chase

Need just a few lengths of seamless brass tube? We'll be glad to hand them to you "over the counter." Or if your job calls for large quantities of brass or copper sheet, rod, wire or tube, we can speed it on its way to you. That's the kind of service you can get by calling your nearest Chase warehouse.

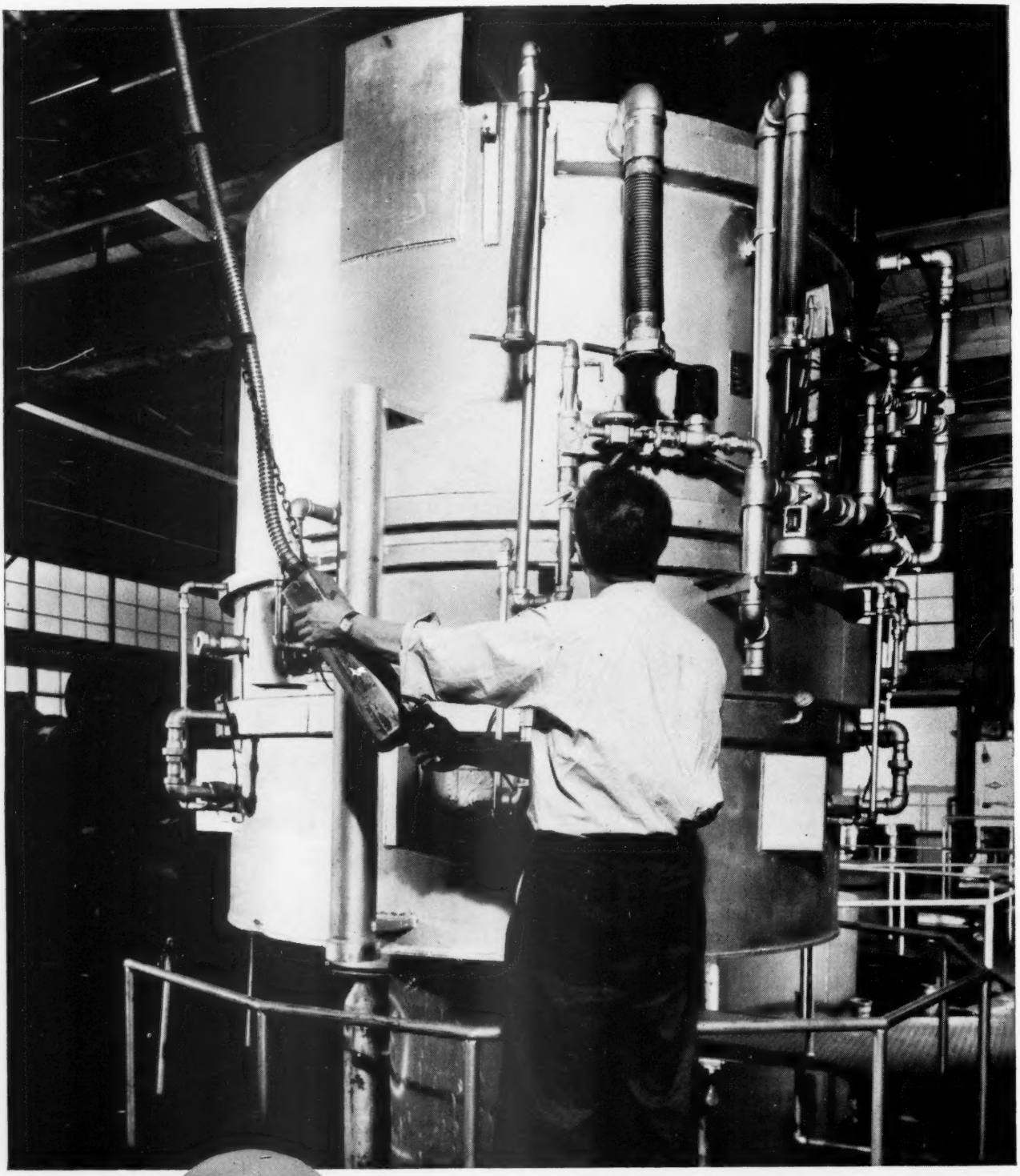
We can supply you with hundreds of items for production, maintenance or repair. That's why it pays to "try Chase first" for anything in brass or copper.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	



IF YOUR PRODUCT CALLS FOR HEAT-TREATING . . . IT CALLS FOR
A WESTINGHOUSE FURNACE . . . *GAS OR ELECTRIC.*

"Top-quality control with new furnace"

says . . . Rodney Metals, Inc.

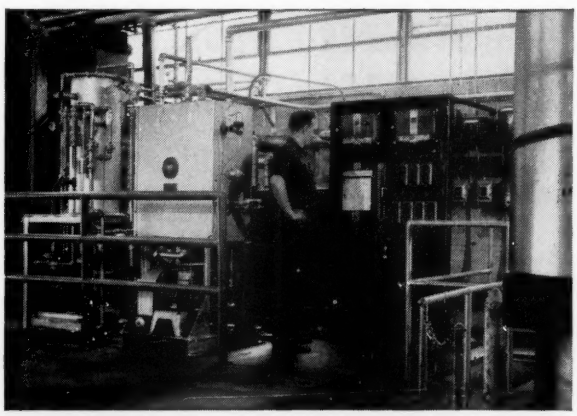
"Before acquiring our Westinghoue Bell-Type Furnace we had to depend on outside sources for the bright annealing of our steel stock. This would frequently result in costly delays. Now that we have our own furnace we avoid all breakdowns of production schedules.

"In a matter of hours, with our Westinghouse integrated operation, our sheet steel warehouse can supply any specific gauge and hardness to the parts manufacturing operation of our affiliated company, Modern Venetian Blinds, Inc. To maintain the high-quality standards of Modern's venetian blind hardware products, it is mandatory that our steel, after annealing, be of uniform hardness and "bright"—free from scale. We have been able to maintain this top-level quality control with our Westinghouse Bell-Type Furnace."

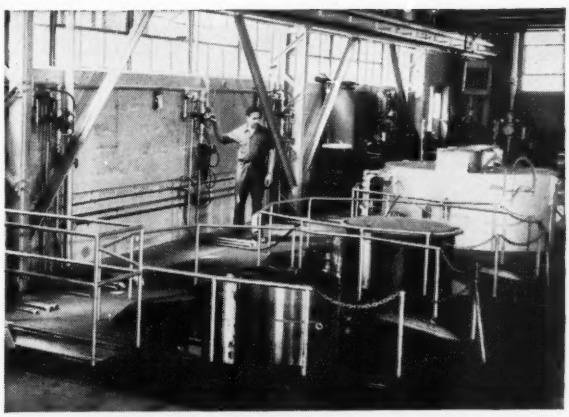
Investigate Westinghouse Heat-Treating Furnaces. Whether it be for your production line, toolroom or laboratory, you'll get the heat-treating flexibility you need and want with Westinghouse Heat-Treating Furnaces . . . GAS or ELECTRIC.

For more information regarding Westinghouse Heat-Treating Furnaces, write today for your copy of the 40-page booklet, *Harnessing Heat* (B-5459) Westinghouse Electric Corporation, Industrial Heating Department, Meadville, Pennsylvania. J-10399

YOU CAN BE SURE... IF IT'S Westinghouse



Exogas® atmosphere generator and control panel used in conjunction with the Westinghouse Bell-Type Furnace. This generator and control panel give constant atmosphere control and absolute temperature reliability.



This is a three-base installation with one Bell, allowing continuous operation. One batch being annealed; one batch cooling under hood; a third batch unloading from base.

HOLDEN ELECTRODE FURNACES

LEASE VERSUS PURCHASE

HOLDEN METALLURGICAL PRODUCTS

Lease benefits:

1. No capital investment.
2. Totally expensed from operating profits.
3. Complete write-off of wiring costs over term of lease.

TYPE 401-4
Marquenching-Austempering Unit

TYPE 701-4
Submerged Electrode Furnace
with removable electrodes.

BENEFITS OF MARQUENCHING AND AUSTEMPERING:

1. LESS DISTORTION
2. IMPROVED WEARING PROPERTIES
3. IMPROVED PHYSICAL PROPERTIES

WRITE FOR 7-PAGE AUSTEMPERING—MARTEMPERING BULLETIN

NEWS! NEWS! NEWS!

HOLDEN MARQUENCHING #296

1. This new salt contains a coagulating material which separates out chlorides.
3. Any sludges are easily removed as soft residual material.

MELTING POINT 295° F.

2. Your melting point and quenching rate can be maintained under any production operating conditions.
4. This product can be used in Holden Marquenching units and competitive furnaces.

IMPORTANT! We can supply our Marquench Additive #356 which can be added to your present salt quenching furnace as a separate item as a coagulant. Therefore, you can buy the coagulating material for competitive quenching salt baths and similarly add the new Holden Marquench #296, which will definitely eliminate your throwing away the quenching salt, and at the same time, obtain more uniform quenching.

Three f.o.b. points:

P. O. Box 1898
New Haven 8, Conn.

THE A. F. HOLDEN COMPANY
11300 Schaefer Highway, Detroit 27, Mich.

3311 E. Slauson Ave.
Los Angeles 58, Calif.

STEELSKIN Lubricants

—and how to use them...

This is the third in a series of advertisements cataloging the complete line of Steelskin Lubricants. Keep this for handy reference.

(No. 3 of a Series)

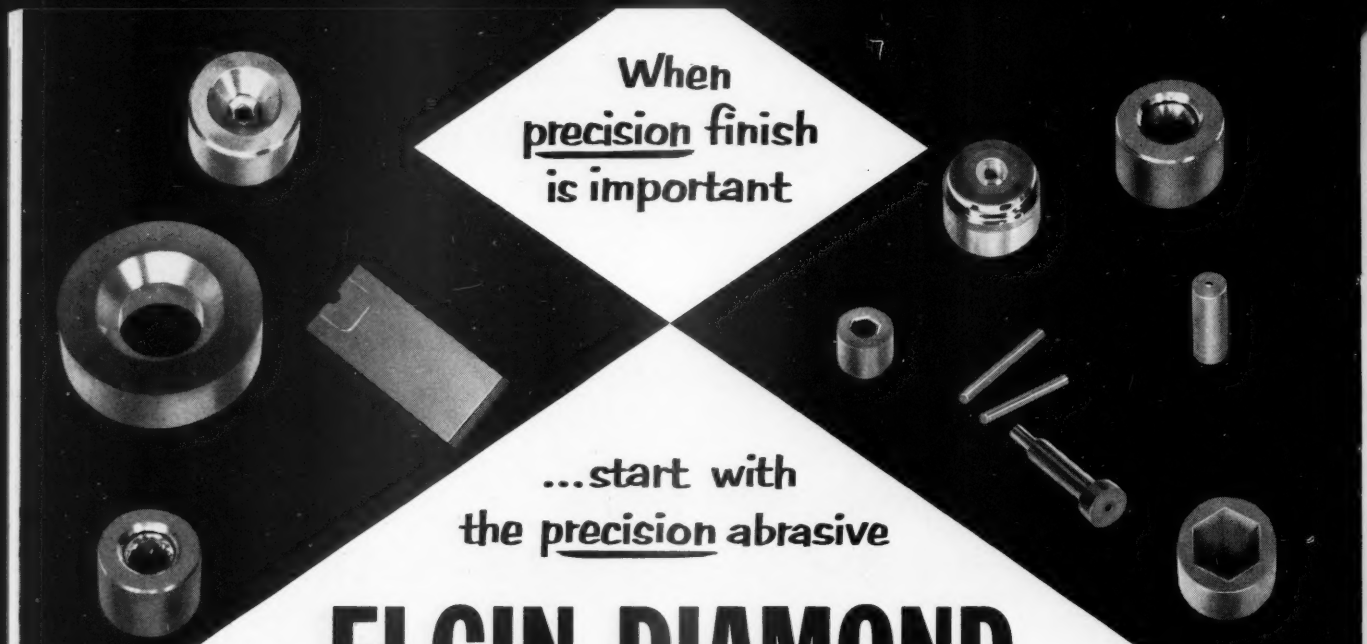
PRODUCT	SHIPPING INFORMATION	USES
AM POWDER	275# NET FIBER DRUM	For dry-drawing steel for rope, tire bead, poultry netting, screen cloth, springs and nails. Also for dry-drawing galvanized.
W-COATING COMPOUND	300# NET FIBER DRUM	A low-cost borax-base coating suitably buffered to provide for better drainage and protection, with longer solution life.
DET PASTE COMPOUND	440# NET	An economical highly-fatted emulsion-type wet-drawing lubricant for use on ferrous and non-ferrous coarse and intermediate sizes.
T-2 POWDER	250# NET FIBER DRUM	An inexpensive compounded sodium soap for use on high- and low-carbon rod and wire. Readily cleaned after drawing and annealing.
CH POWDER	250# NET FIBER DRUM	A very rich metallic stearate for use on stainless steel and fine high-carbon wire. Also for dry-drawing galvanized wire.
WT-G PASTE COMPOUND	400# NET STEEL DRUM	This readily dispersible paste is especially suitable for drawing coarse copper-coated wire (welding rod) and galvanized wire (wet).
850-C POWDER	350# NET FIBER DRUM	A special formulation for drawing descaled rods to provide a good nail-cutting finish.
EZ FOAMER POWDER	250# NET FIBER DRUM	To produce a foam blanket on acid tubs in the cleaning house. Also available as a liquid in 55-gal. steel drums.

Steelskin LUBRICANTS

R. H. MILLER

Company, Inc., Homer 1, N. Y.

SOAPS AND COMPOUNDS FOR WIRE DRAWING, TUBE DRAWING, DEEP DRAWING AND STAMPING.



When precision finish is important

...start with the precision abrasive

ELGIN DIAMOND

At ALLIED MANUFACTURING COMPANY of Worcester, Massachusetts, a leading producer of special carbide dies and tools, they demand precision finishes . . . and they rely on Elgin Diamond in DYMO-C*, the precision diamond abrasive! Precision graded for absolute particle uniformity, Elgin Diamond assures uniform, predictable results with maximum cutting speed. Operators like it, too, because it comes ready to use—there is no need for mixing or preparation of any kind. Whatever your finishing need, Elgin offers a full range of Bureau of Standards grades, each distinctly color identified to give you finer finishes, faster. Every day, more and more leading producers find that . . .

Better results begin when you finish with diamond...

ELGIN DIAMOND

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

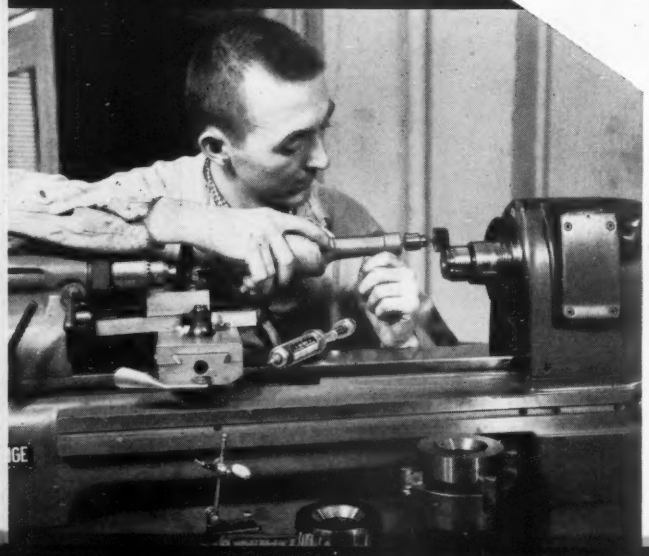
ELGIN, ILLINOIS

Dept. G

Ask for a free demonstration!

* C for Carbides.

Here, a carbide curling punch for forming the bead on flashlight casings is precision finished on a rotary felt wheel at ALLIED. ELGIN DYMO-C, grade 30, is used in this operation for accurate sizing in less time.



This ALLIED operator is using a rotary felt bob and ELGIN DYMO-C to polish carbide sizing pins. Again, Elgin Diamond meets ALLIED'S requirements for consistent accuracy and flawless finishes—every time!

DON'T GUESS

when it involves capital expenditures.

consult a company of high reputation.

Technical BULLETINS are available for all models of EQUIPMENT

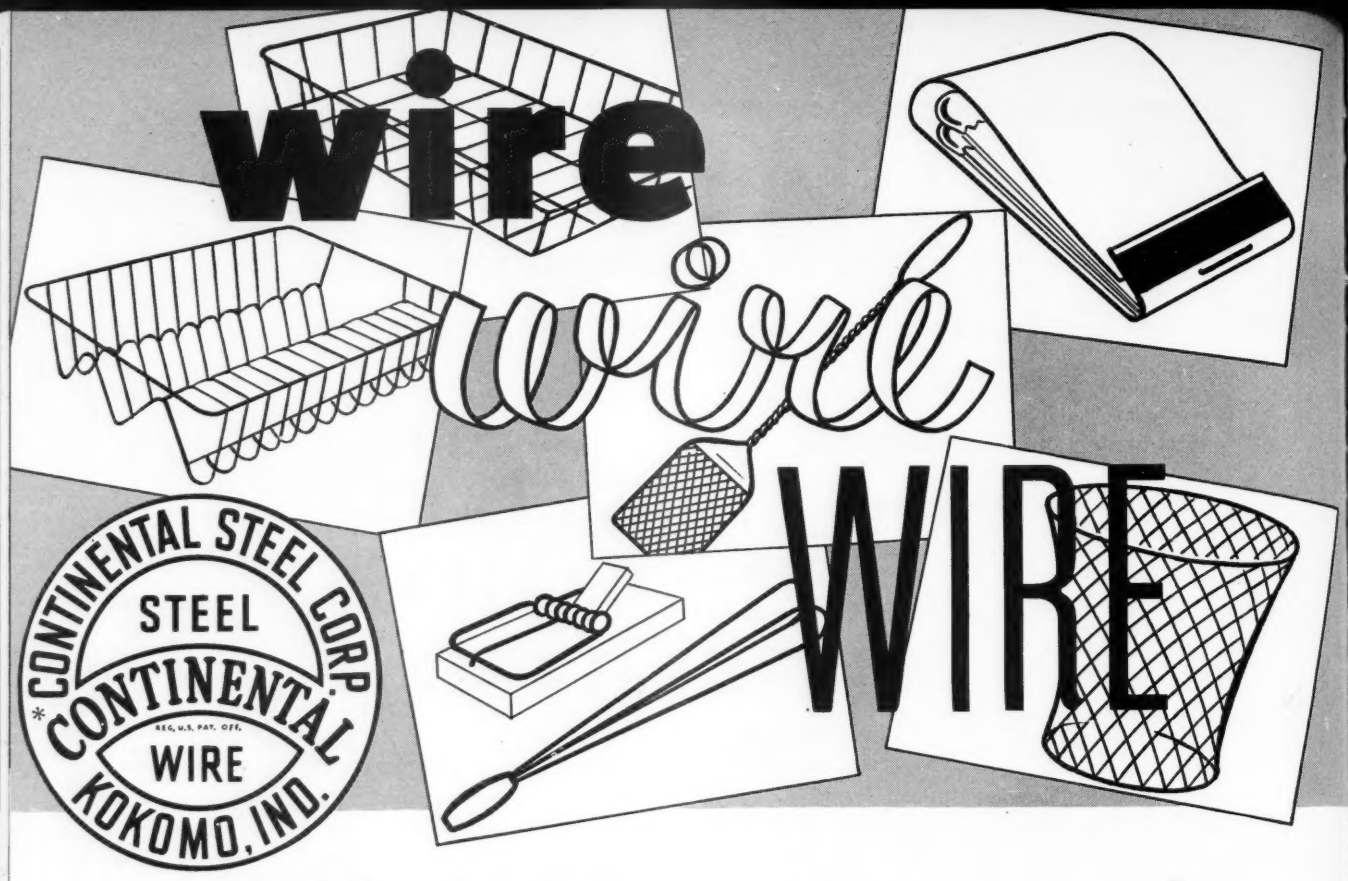
Send for your CATALOG - Today.

SYNCRO

Better Machinery for the Wire Industry

MACHINE PERTH AMBOY. N. J., U. S A. COMPANY

affiliated Company: WINGET-SYNCRO Lt'd. Rochester • Kent • ENGLAND



. . . for most wire needs

A WIDE VARIETY OF WIRE APPLICATIONS

Continental Spiral Binding Wire . . . Braces for Automobile Fenders . . . Spokes for Steering Wheels . . . Wheel Spokes for Toys and Wagons . . . Yoke for TV Picture Tubes . . . (four times size of human hair) Heavy Wire for Hose Reels . . . Structural Framework for Trash Burners . . . Wire for Stapling and Paper Clips . . . Bolt-wire for Metal Fasteners . . . Florists' Wire . . .

Be sure you are getting the best wire for every job . . . wire that's tailored to fit your product needs. Wire of uniform quality that welds easily, securely, and forms under stress without fracturing the wire or its coating. To assure getting this fullest wire value, take advantage of Continental's continuing research and testing. Listed at left are just a few of the Continental wire types made to exacting analyses, tempers, finishes and shapes. Continental's wire service record is your guarantee that Continental goes all-out to produce the finest wire possible—for each application. Valuable case histories and the experience gained in more than a half-century of wire-making are brought to bear on your wire problem. Call or write Continental at Kokomo for the help you need with wire.

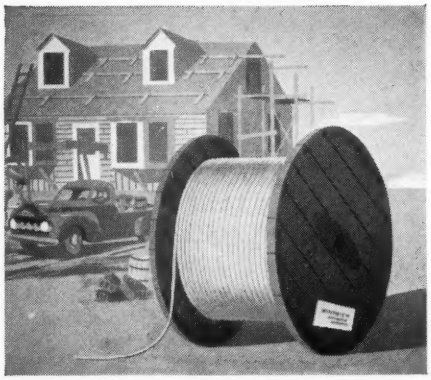
CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

Flame resistance

is a job for CELLUFLEX* 179C



DESCRIPTIVE DATA

CELANESE PLASTICIZER	GRADE	APPEARANCE	COLOR APHA Max.	SPECIFIC GRAVITY @ 20/20°C.	ACIDITY	ESTER VALUE % Min.	PERMANGANATE TIME, Min. (in Minutes)	REFRACTIVE INDEX @ $n\frac{25°C.}{D}$
LINDOL* tricresyl phosphate coal tar base	Technical	Clear transparent liquid	75	1.165 ± .005	0.01 (3)	99	30	1.553
CELLUFLEX* 112 a mixed ester	Technical	Clear transparent liquid	40	1.210 ± .005	0.01 (3)	99	30	1.560
CELLUFLEX* 179C tricresyl phosphate petroleum base	Technical	Clear transparent liquid	150	1.165 ± .005	0.01 (3)	99	30	1.553
CELLUFLEX* TPP triphenyl phosphate	Technical	White flakes	20	—	0.003 (3)	99	30	1.550 (1)
CELLUFLEX* DBP dibutyl phthalate	Technical	Clear transparent liquid	50	1.045 ± .001	0.01 (2)	98	—	1.490
CELLUFLEX* DOP dioctyl phthalate	Technical	Clear transparent liquid	50	0.986 ± .002	0.01 (2)	98	—	1.485

(1) @ 20°C. (2) % as phthalic, max. (3) % as phosphoric, max.

Celluflex 179C—tricresyl phosphate—is the standard of comparison among flame-resistant plasticizers for electrical applications. It has very low volatility, excellent solvent power, a high degree of permanence . . . produces a tough, flexible vinyl film with excellent weathering properties.

Celanese—pioneer in the development of tricresyl phosphate plasticizers—today offers an expanding list of Celluflex Plasticizers designed to fit a broad range of applications. The Celanese Technical Service and Application Laboratory is fully equipped to assist you in resin formulating and testing. Bulk stocks of Celanese Plasticizers are maintained at centrally located distribution points for prompt delivery.

Celanese Corporation of America, Chemical Division, Dept. 590-H, 180 Madison Avenue, New York 16.

Celanese* CHEMICALS

*Reg. U. S. Pat. Off.

Complete service

ON PLASTIC WIRE INSULATION UNIT

DESIGNING • BUILDING • INSTALLING

National Erie products for the Plastic and Rubber Industries • Extruders • Simplex Doors for Autoclaves • Mills d Hydraulic Presses. This old and well-known ne of machinery was acquired March 1, 1952, y The Aetna-Standard Engineering Company. They are manufactured in their Warren, Ohio, and Ellwood City, Pa., plants. The sales and engineering of the National Erie line is the responsibility of Hale and Kullgren, Inc., Akron, Ohio.

● We offer a complete plastic wire insulating line as illustrated below. The combination of engineering by Hale and Kullgren and manufacturing by The Aetna-Standard Engineering Company assures you of a completely integrated installation.

A new design Extruder provides high production rates as a result of efficient heat and proper screw proportions.

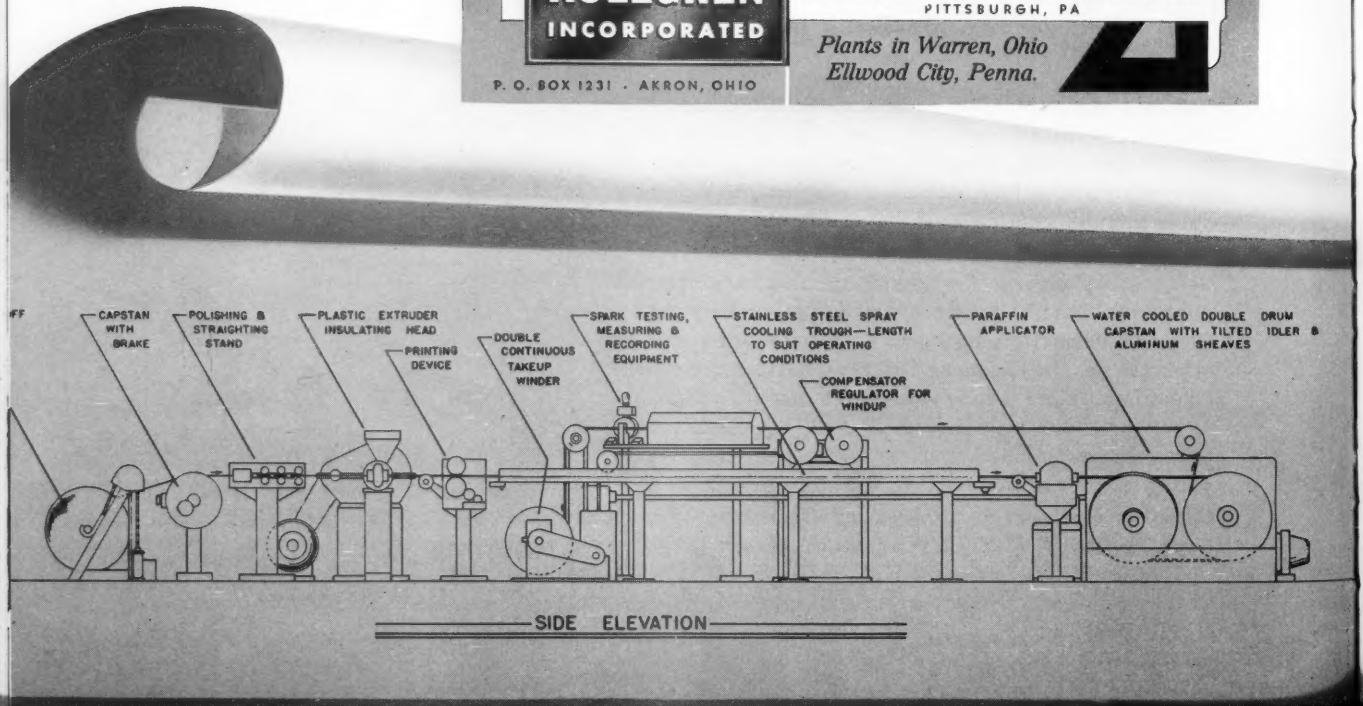
Give us your production requirements and we will be pleased to submit our suggestion on efficient equipment for your process.

Address your inquiry to Hale and Kullgren, Inc., P. O. Box 1231, Akron, Ohio.

COMPLETE SERVICE ON RUBBER & PLASTICS
a complete plant : a specialized process : an engineering service or individual machines

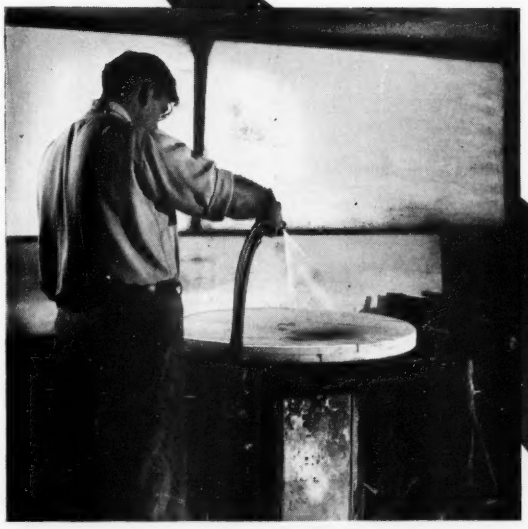
SALES and ENGINEERING by
HALE AND KULLGREN INCORPORATED
P. O. BOX 1231 · AKRON, OHIO

MANUFACTURING by
Aetna-Standard
THE AETNA-STANDARD ENGINEERING CO.
PITTSBURGH, PA
Plants in Warren, Ohio
Ellwood City, Penna.


CAPSTAN WITH BRAKE
POLISHING & STRAIGHTING STAND
PLASTIC EXTRUDER INSULATING HEAD
PRINTING DEVICE
DOUBLE CONTINUOUS TAKEUP WINDER
SPARK TESTING, MEASURING & RECORDING EQUIPMENT
STAINLESS STEEL SPRAY COOLING TROUGH—LENGTH TO SUIT OPERATING CONDITIONS
COMPENSATOR REGULATOR FOR WINDUP
PARAFFIN APPLICATOR
WATER COOLED DOUBLE DRUM CAPSTAN WITH TILTED IDLER & ALUMINUM SHEAVES

SIDE ELEVATION

GET YOUR REELS AS ORDERED



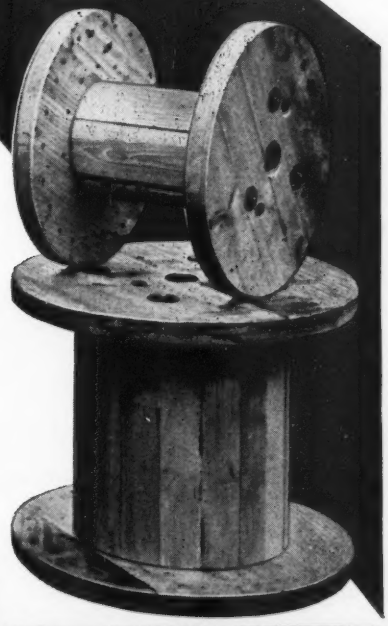
Above: reels being painted

BRIDGE WOOD REELS SHIPPING AND SHOP—ALL TYPES

12" to 96" in diameter, knocked down or assembled; returnable or non-returnable; wood heads for steel drums. All precision-made to your specifications, strong for severe handling, low in cost.

EVERY MILL HAS ITS OWN REEL SPECIFICATIONS

Bridge is equipped to meet your specifications accurately and without delays. Our straight-line production methods and efficient automatic equipment turns out reels accurately, fast and at low cost. Every reel is a quality product, designed for the toughest conditions of service. Bridge reels come to you "as ordered" both as to specifications and delivery dates.



PLUS A SPEEDY SHIPPING SERVICE

BRIDGE
MANUFACTURING CO.
HAZARDVILLE, CONN.
Phone Thompsonville, 3375

HERBORN

NON-SLIP CONTINUOUS WIRE DRAWING MACHINE, MODEL G. M. I., straight pull, without upper by-pass, suitable for drawing high quality steel wires from .354" maximum.

We construct wire drawing machines performing all kinds of drawing operations. We are always ready to advise you on all further details.

MASCHINENFABRIK HERBORN BERKENHOFF & DREBES A.-G.

Our speciality: Machines for wire industry **HERBORN** (DILLKREIS) Germany

Representative of our products in the U.S.: Kurt Orban Company, Inc.
205 East 42nd Street, New York 17, N.Y. — Phone: Murray Hill 4-7700

Your visit to our works at Herborn (Dillkreis) 300 miles from Brussels is kindly invited.

What kind of wire do YOU want?

You want manufacturers wire to be uniform in grade, strength and analysis . . . free from harmful imperfections . . . meeting specifications exactly. And that's the kind of wire we've been turning out for over a hundred years. Today we can offer you over 400 different types of American Manufacturers Wire, of every size, shape, finish, and metallurgical characteristic . . . and of *consistently* high quality. All this helps to simplify your fabrication job.

Here's another way we can help you. Our staff of trained metallurgists and engineers know wire-application problems inside-out. They've assisted thousands of manufacturers in finding the most suitable wire for a specific job . . . in cutting costs and improving products. And these men are at your service, ready to go to work on your problems too.

If you want a type of wire that we don't regularly produce, you can depend on our modern plant facilities to draw a special wire that will fit your needs exactly. Call our nearest sales office for further information.

If you make it of wire... make it of the best!

U·S·S AMERICAN MANUFACTURERS WIRE

AMERICAN MANUFACTURERS WIRE

AMERFINE—*High-quality fine wire.*

AMERSPRING—*music steel spring wire.*

AMERLOY—*alloy heading wire.*

AMERTEMP—*heavy-duty oil-tempered wire.*

AMERHEAD—*uniform heading wire.*

AMERSTITCH—*extra-tough metal stitching wire.*

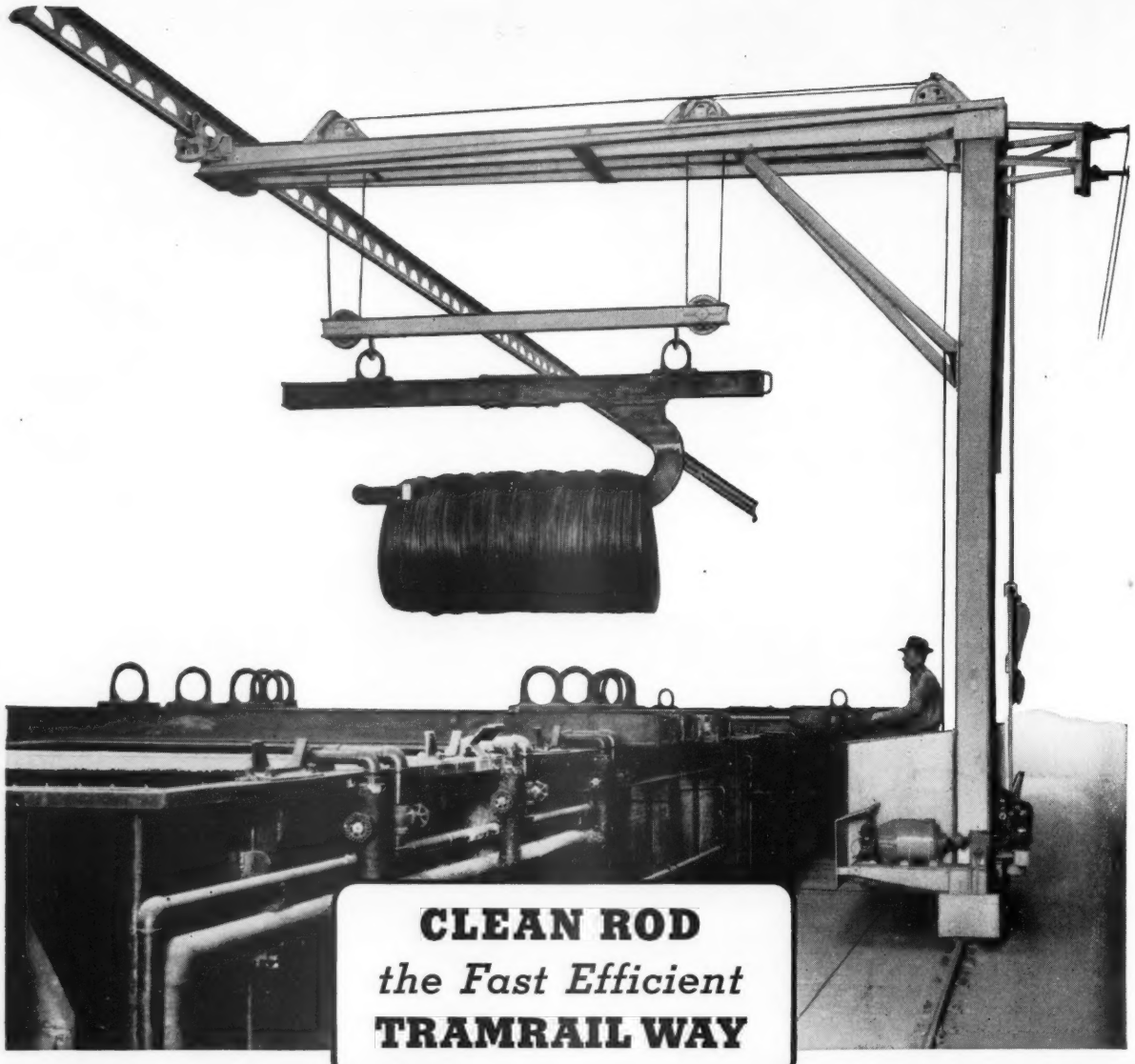
USS TRADE MARK

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS

TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

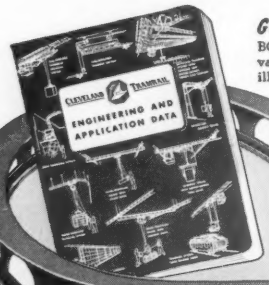


CLEAN ROD
the Fast Efficient
TRAMRAIL WAY

With a Cleveland Tramrail Cleaning House Gantry Crane a cleaning house can be organized to secure the advantages of straight line production efficiency. This cuts space required, enforces cleanliness and better working conditions. Of prime importance it speeds production and brings down costs tremendously.

All operations—acid bath, rinse, lime dip, bake—can be handled by one man, and of significance, far greater tonnage can be cleaned per day than by customary methods.

Let us give you the facts about many successful cleaning house installations.

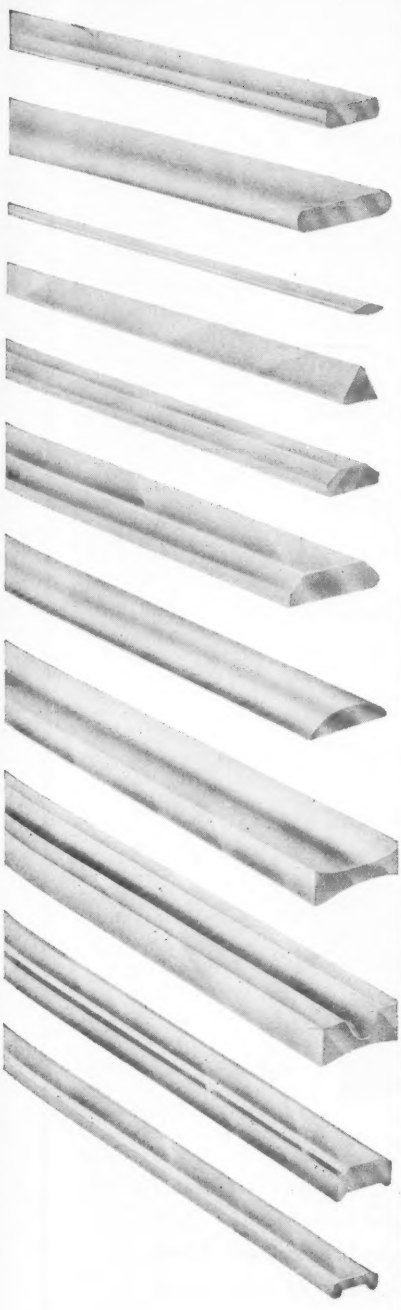


GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9208 EAST 288th STREET • WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



NATIONAL WIRE

(COLD ROLLED)

in Coils or Straight Lengths

COMPLETE METALLURGICAL SERVICE

Manufacturers of

SPRING WASHERS	RETAINING RINGS
ROUND EDGE FLAT WIRE	KEYSTONE SHAPED WIRE
SQUARE EDGE FLAT WIRE	SPECIAL SHAPED WIRE

Shaped Wire in Coils or Straight Lengths, Ferrous or Non-Ferrous.

LARGE OR SMALL QUANTITIES

Manufactured by

THE NATIONAL LOCK WASHER COMPANY

PRECISION SHAPED WIRE DIVISION

NEWARK 5, N. J. MILWAUKEE 2, WIS. U.S.A.

WIREMEN...

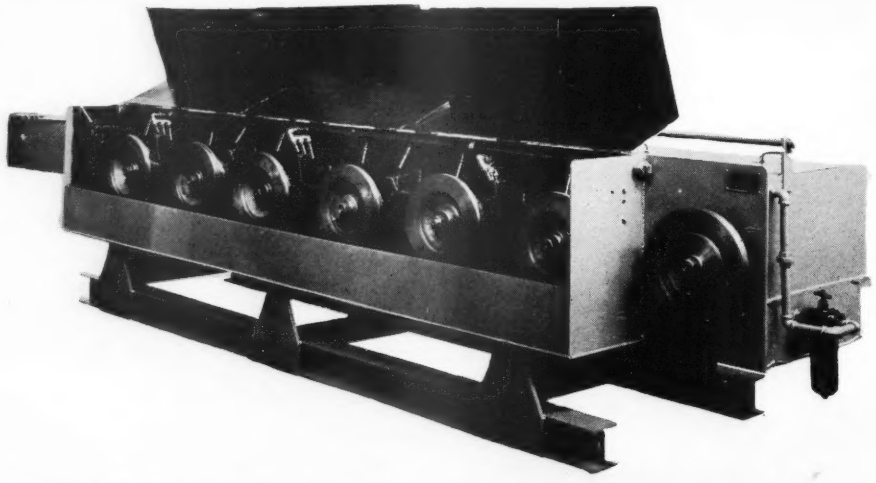
LOOK BEFORE YOU BUY

If you are thinking of enlarging your present plant capacity by the purchase of additional rod breakdown equipment, you owe it to yourself to investigate the many worthwhile features of the Cook High Speed Rod Breakdown equipment.

Cook Manufacturing Company builds a complete line of Rod equipment for all non-ferrous metals. These include 9, 13, and 17 die machines. The performance characteristics of this equipment are indicated in the table at the right.

Max. No. of Dies	Max. Entering Wire Size	Min. Finish Wire Size	Max. Finishing Speed
17	5/16" Dia.	B&S #19	5000 FPM
13	5/16" Dia.	B&S #16	3200 FPM
9	3/8" Dia.	B&S #12	1700 FPM

Shown below is the front view of the Cook 13 die machine excluding the take-up spooler. Note the rugged all-welded construction.

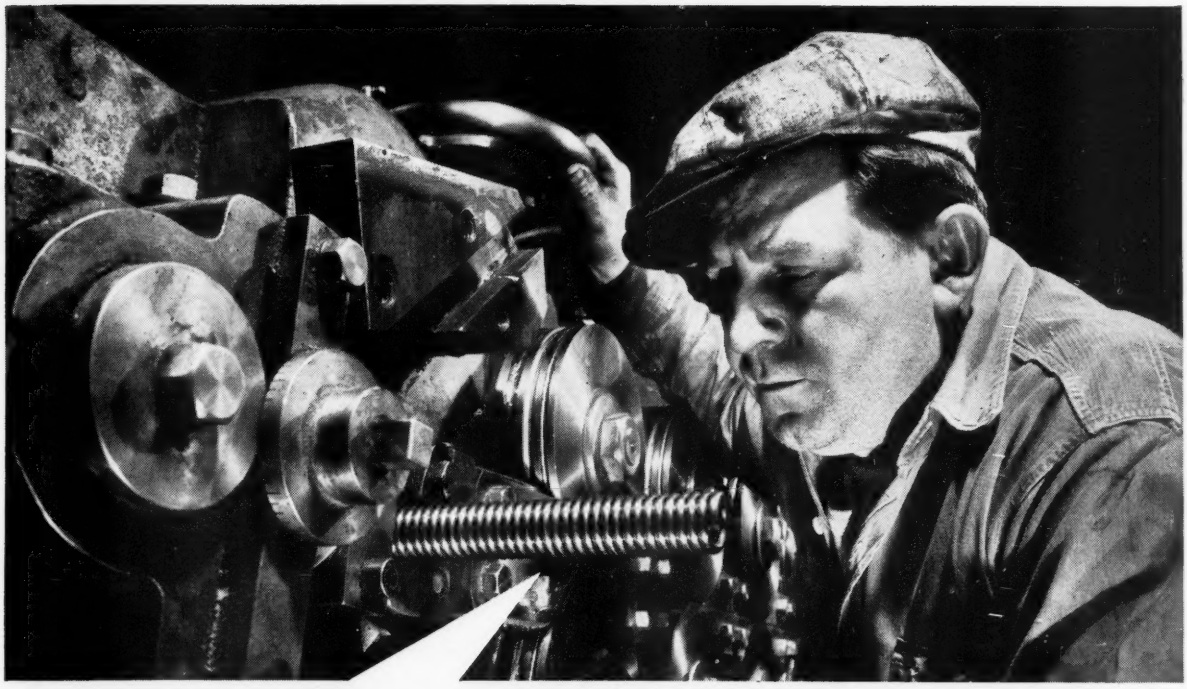


This machine is designed for long life and ease of string-up. All capstans have replaceable hard metal wearing bands. A forced feed lubricating system assures a full and complete flow of oil to all vital parts. The capstans are driven by pre-loaded chain which eliminates idler pulleys. Chain stretch has been eliminated and the machine is built to give long and continuous 24 hour service with a minimum of maintenance.

Write today for descriptive literature giving details of construction and performance of this high speed heavy duty Rod Breakdown Equipment.

COOK MANUFACTURING COMPANY

265 NORTH 9th STREET **PATERSON 2, N. J.**



Users tell the quality story

Diamond Wire Spring Company makes long runs, eliminates costly breaks with Pittsburgh Steel Oil Tempered Spring Wire

Skilled workmen, modern machines and Pittsburgh Oil Tempered Spring Wire form a combination that is hard to beat for producing quality springs with economy. *Users tell the quality story* better than we can. For example, skilled machine operators at the Diamond Wire Spring Company plant in Millvale, Pa., sum it up this way. They like Pittsburgh Wire because it enables them to make long runs without costly stops caused by broken wire. Matthew Kline, a veteran with twenty years experience making steel springs, said:

"Pittsburgh Wire is good stuff. I can tell by the way it handles whether it's Pittsburgh or some other make. I like it because it keeps my machine going full tilt for long runs. The management likes it too—helps keep costs down."

For this reason, Diamond Wire Spring Company uses tons of Pittsburgh Steel's Oil Tempered Spring Wire to produce thousands on thousands of springs for farm implement machinery and journal box lids for railroads.

If you manufacture springs and other products from wire, we would like to show you how others eliminate production difficulties, maintain high quality of their products with Pittsburgh Oil Tempered Spring Wire. Just give it a trial.

For information about our high quality wire and wire products write Department WW, Pittsburgh Steel Company, Grant Building, Pittsburgh 30, Pa.

Pittsburgh Wire

a product of **Pittsburgh Steel Company**

SINCE 1873

MALMEDIE

PRODUCTION PROGRAMME

Wire Drawing Machines

Bull Blocks (horizontal and vertical)
Double Deck Blocks
Multiple Block Machines
Copper Wire Drawing Machines for heavy and medium gauges
Trolley Wire Drawing Machines, Pointers, Coil Winders

Cold Headers

Single Blow - Double Blow Cold Headers
for the making of: Rivets, Bolts, Woodscrews, Balls, cylindrical or taper Rollers
Head Trimmers Thread Rollers

Cold Working Nut Presses
Barbed Wire Machines
Wire Nail Presses
Wire Straightening and Cutting Machines
Hexagonal Netting Machines

Malmedie - Bibby Flexible Couplings
Jaw Clutch Couplings
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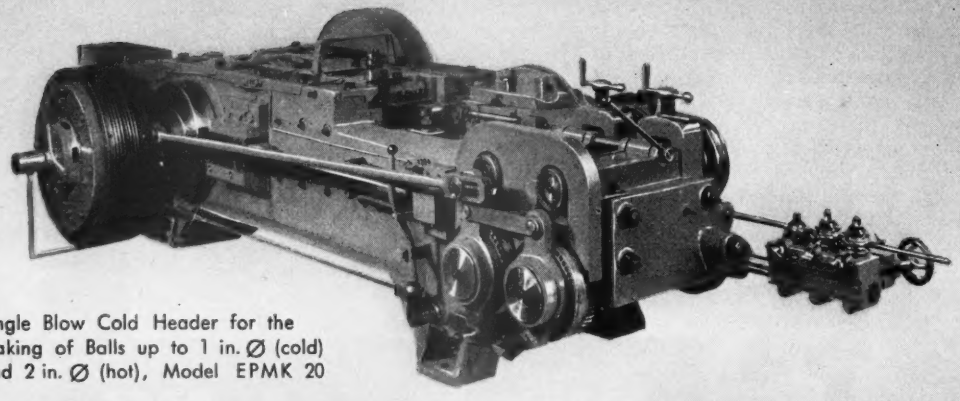

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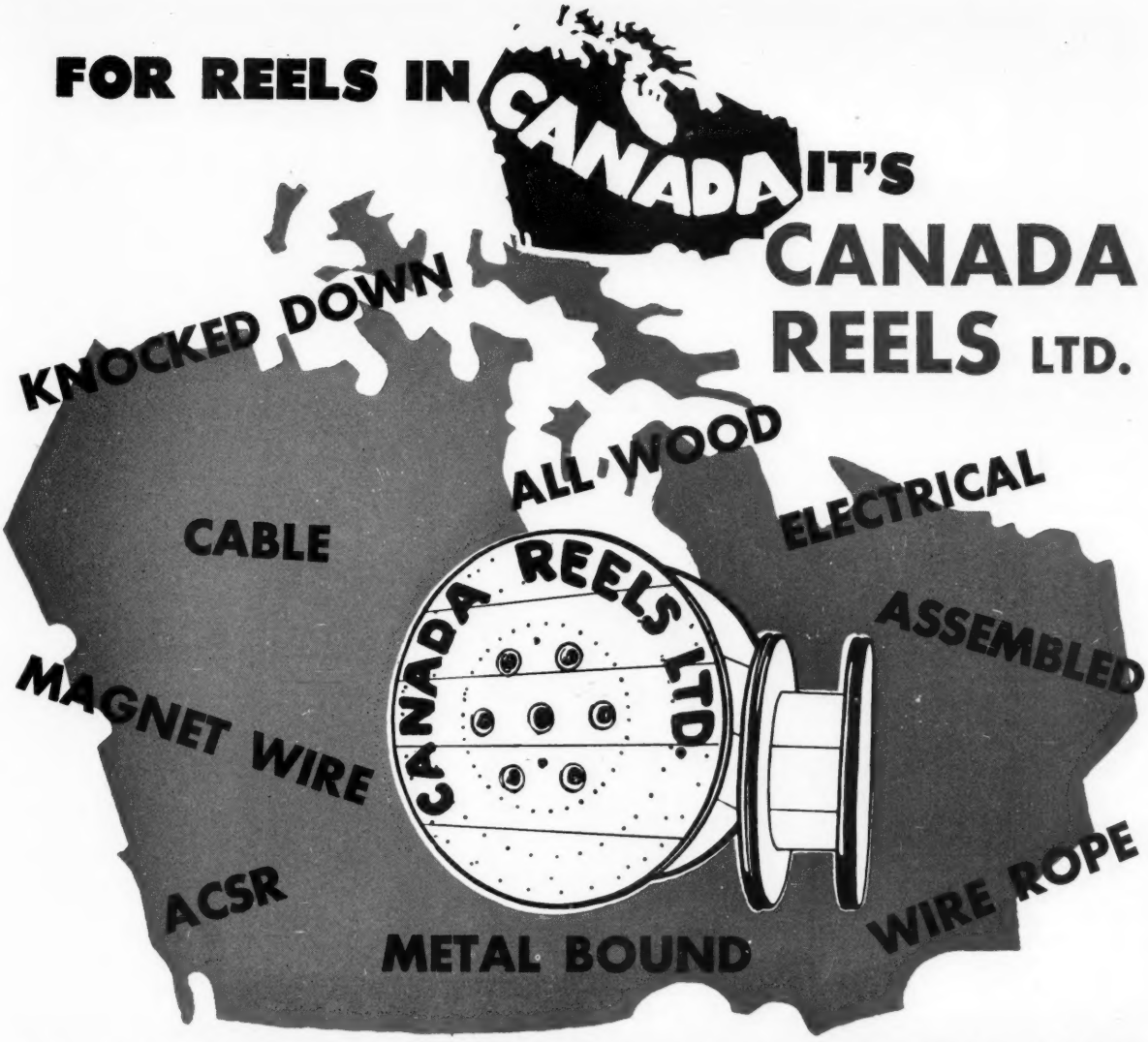

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The Wire Outlook

One of the heartening developments of recent weeks are the steps being taken to sell to private capital the rubber plants and power developments built by the Federal Government. Mr. Eisenhower has referred to TVA as "creeping socialism." He was generous. It is outright socialism. Every business owned and operated by the Government or its too numerous agencies should be summarily disposed of to private enterprise.

When Government builds, there is graft, corruption and waste. When it operates, there are soft jobs, uneconomic operation and politics involved. And under New and Fair Deal operation there was not even an honest and true picture of the financial status of these "businesses." Besides which, these potential taxpayers became perforce actual burdens upon the rest of the taxpayers, both business and individual. It has been pointed out that the present Administration inherited over 50 businesses that functioned in competition with private enterprise.

Consumption of steel continues at near capacity levels and the future looks stable. An executive of a large producer recently stated his belief that "this country can support an expanded steel industry because of the growing need for steel." It was pointed out that "even a drop to something like 80% of capacity would support the steel industry." It is unlikely that production will go that low, especially if peace in Korea and tax reductions, result in an anticipated loosening of the consumer's purse strings. Borrowings have dropped, savings have risen and sales to consumers have increased faster than inventories. In manufacturing the ratios of inventories to sales are the lowest in more than a year. These are healthy conditions, business-wise.

The outlay for capital goods looks favorable. Industry will spend 27 billions for new plant and equipment in 1953 and while this rate may not be sustained, volume should be satisfactory, for replacement needs alone amount to 23 billions a year.

National value and services of goods is at an all-time high. The rate for the first half was 360 billions, with prospects of 355 billions for the year. This compares with 259 billions in 1948 and 346 billions in 1952. Much of this increase, however, represents the higher prices paid for products.

Aluminum stocks have improved in warehouses and are running about 75% of normal. Third quarter production should run about 325,000 tons, 110,000 of which will come from new facilities recently put into operation.

Beryllium copper bar, rod and wire are now readily available for shipment and coarse wire for re-drawing is moving well.

Brass and copper mills are using more copper than earlier this year. Everyone expects a price drop, as December futures are already selling at around 25 cents. Even Chilean copper may have to get in line with world prices or go begging—it now costs 11 cents more than other copper.

While on major tonnage wire mills are booked through September, there has been some slow-down in wire orders. Wire rope is slow and readily available. Demand for upholstery wire has eased and is not expected to be too good if auto production schedules are cut back. There has been some increase in the demand for merchant wire products, but the bulk of the sales are still in manufacturers' wire items. Most non-integrated mills are getting their rod supplies in better shape than for years.

Even with a truce, most businessmen are optimistic. There should be no sharp letdown in business as the effects of a truce have long since been discounted.

—from the Editor's Desk

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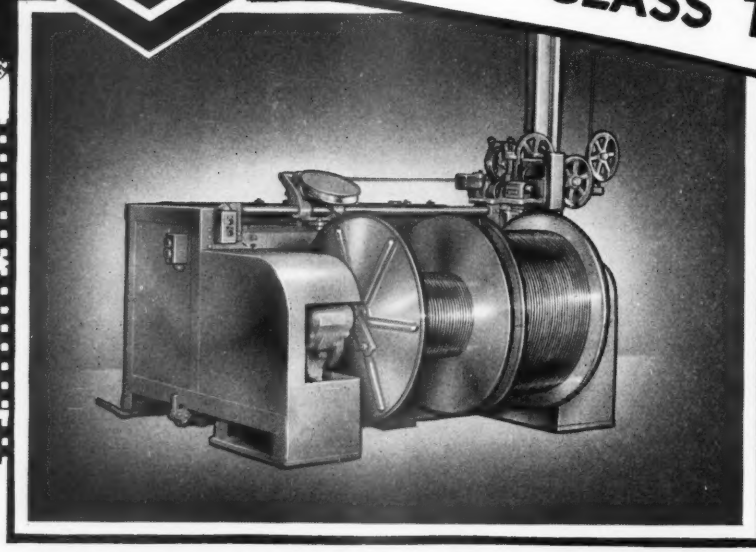

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See Page 819 for a complete listing of JLE Products for the Insulated and Bare Wire Industry

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Vol. 28 AUGUST, 1953 No. 8

Wire Rope Origin and Development

by R. F. Hendrick, Vice President
E. H. Edwards Company
South San Francisco, California

In this paper presented at the Pacific Coast Regional Meeting of The Wire Association in San Francisco, California on June 12, 1953, Mr. Hendrick gives a history of wire rope, a description of those properties in wire that are essential to good rope and a thumb-nail sketch of what the future holds.

Introduction

For reasons which you can probably well understand, I feel tonight very much like the teacher of a small school who was asked to prepare a talk about his particular work and deliver it before the teachers during their institute session. Naturally, he was elated, and accepted the invitation not realizing how difficult it would be to prepare and deliver an interesting talk before a group of people who were experts in that particular line. He labored long and diligently and finally completed his address.

★ ★ ★

On the fateful evening as he stood before the group to present his paper, his knees were weak and his voice was quivering as he commenced his reading. Soon, from the gallery, a voice called out, "louder". He tried to raise his voice but his tongue seemed to be sticking in his throat. Soon the voice from the gallery came again, "will the speaker please talk just a little louder. We cannot hear you up here".

★ ★ ★

Before he could answer, an elderly gentleman who was sitting in the front row, and could hear, but was evidently being bored by the contents of the address, stood up, turned around to the gallery and shouted, "sit down brother. Sit down and thank God".

Product Importance

It is indeed amazing how little is known, even by the average technical man, about such a commonplace, every day item, as wire rope. It is commonly referred to as line, cable, rope, wire, or any other descriptive term which may be in common usage in the area where the wire rope is being used.

★ ★ ★

It is also amazing how few people realize the very important and essential part this prozaic item plays in each of their individual lives. Forgetting such novelty uses as the San Francisco Cable Cars (and in view of our transportation problem, I believe that novelty is the correct word), the wonderful suspension bridges that span our harbors and rivers, (indeed these are not even wire ropes at all) you have only to look at our Skyscrapers in every large city where we are whisked from floor to floor by wire rope—indeed such buildings could not even be built without the use of hoisting equipment utilizing the product. Look further to your homes whose timbers must come from the woods—by means of wire rope, your automobiles whose steel must come from the ore mines, yes even the very fuel they consume comes out of the ground because a wire rope made the drilling of the well a possibility. Similar examples could be recited by the score—but to little purpose — unfortunately for the ego of our industry, wire rope is used on equipment and machinery which is far more spectacular than our humble product, and our industry will have to console ourselves that we at least realize how important and essential a dependable, quality product such as ours is to each of our everyday lives.

Origin of Wire Rope

As we delve back into history in an attempt to discover the beginnings of this product and its development through the years, we find two basic facts:

First that its development is tied directly to the development of wire and the wire mill itself and,

Second that there is damned little history of the product in concise recorded form of any dependable kind. The majority of the "authorities" on the subject

preface their statements with—"it is alleged that, or—it is believed that, or—it would seem that." In any event it would appear that historians generally were on a par with the average individual today, and what was happening in the wire rope field then, was apparently not uppermost in their minds.

★ ★ ★

When I accepted this assignment from my good friend Joe Kemple, like the teacher at the institute, I realized not what I had contracted for. Joe said—make it short—keep it interesting and don't get technical. I should have had my head examined for signing a blank check of this kind.

★ ★ ★

At any rate I found myself in the position of the colored pastor who was asked how he was able to get his congregation to attend on Sundays—to which he replied "Well suh, it am fine to stick to de Gospel, but when ah wants to fill de house ob de Lod, ah finds folks is curious so ah advertises dat I'se gwine to explain de unexplainable, define de undefinable and unscrew de unscrutable".

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Here is history for what it is worth to you and I—

There resides today, in the Muzio Barbonico at Naples, Italy a fifteen foot sample of 1" lang lay bronze rope used by the Romans over 2400 years ago. There are indications, but no positive proof, that the Vikings were using crude wire rope lashings in the 8th Century or there about. The Chinese are credited with the use of wire rope for construction rope-ways across rivers as long as 1500 years ago. A book in the library at Vienna dated 1400 shows the drawing of a rope-way.

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Coming closer to our present era, we find definite record in the Danzig "Chronicles" that a Dutch engineer by the name of Adam constructed an aerial rope-way in that town in the year 1644. It was not, however, until the middle 1800's that wire rope seems to have become an entity unto itself.

★ ★ ★

In 1837, Professor Albert of Clausthal, Germany, invented what is known today in the trade as Lang's Lay rope. This construction is known as Lang's Lay because Lang was successful in obtaining a patent on this construction in England over 40 years later even though it had been in use in England at the time for more than 10 years.

★ ★ ★

In this country, about 1840, a man by the name of John Roebling, received word that a man in Saxony by the name of Freiburg had "braided" several wires together to form a wire rope. Roebling decided to duplicate this feat for use in canals and haulage ways —and from this start was founded the John A. Roebling Company which has continued to serve the wire rope consuming trades to this very day. From such humble beginings has our industry grown.

Development of the Product

You must realize, of course, that wire rope referred to in ancient days was indeed of crude affair compared to precision product that you and I know today. Wires of soft metal were made from slit sheets, beaten and pounded into rough wire form and laboriously pulled through crude dies by brute manpower. Individual wire lengths were short and the pieces were continually brazed together into a final single ununiform length of finished wire. The miracle indeed, is that the tremendous labor involved, was expended in the manufacture of the crude resultant product.

★ ★ ★

Wire rope, which serves all industries today, is actually a product of the wire and wire mill improvement, rather than improved rope shop practices. Basically, wire rope is a machine composed of a multiplicity of wires twisted into strands and the strands themselves closed or formed around a central core. As wire mill practice has improved and a better wire product has resulted, wire rope itself has become an improved product.

★ ★ ★

The first basic improvement in rope wire which directly effected and made possible the high quality product we know today, occurred in England in the year 1854. James Horsfall of the Hay Mills made the discovery of producing a sorbitic steel structure by continuous heating and quenching direct from furnace temperatures. The usual way of making wire at that time was to anneal it repeatedly, making it sufficiently soft to enable the workmen to reduce it to size. Horsfall had been experimenting with processes of hardening and quenching but found that this new and revolutionary process not only eliminated this labor but produced a product infinitely superior in ductility and capable of a reduction of 90 per cent of original area without further heat treatment. This process of tempering the wire by passing it through a controlled bath of molten lead was a complete revolution in the trade. I sincerely believe, that this fundamental discovery, which has made possible wire rope as we know it today, was also in a large sense basically responsible for all the modern wonders we enjoy today.

★ ★ ★

Horsfall patented his discovery in 1854, 1856 and 1858. Competitors, however, soon began getting around the basic patents by pulling wire through furnace tubes into air or winding the coils from a beehive annealing muffle. After unsuccessfully attempting to stop such practices by legal means, Horsfall resorted to privacy and took the strictest measures to ensure secrecy in his operations. None but a few highly paid and trusted employees were allowed to enter the "Patent Shop" and the process came to be known as Patenting and the product sold and distributed under the description of Patent Steel Wire. Although the secrecy of the process is now gone, the name remains to this day and all rope wire is "Patented" wire.

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Perhaps my comments so far have given the impression that all progress has been made in the wire mill and none in the rope shop. Such is not actually the case as improvements in strand construction and methods of forming such constructions have continually improved. Basically, however, such

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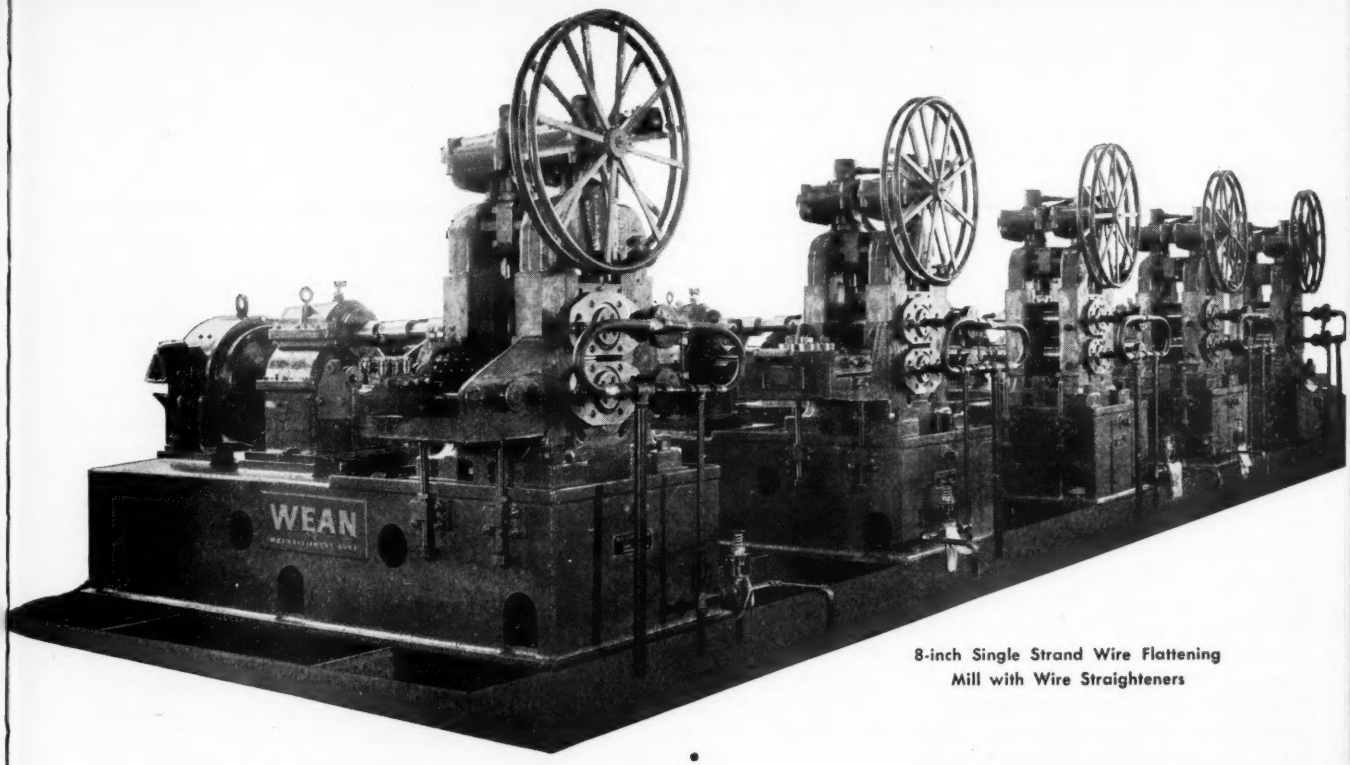
Wean



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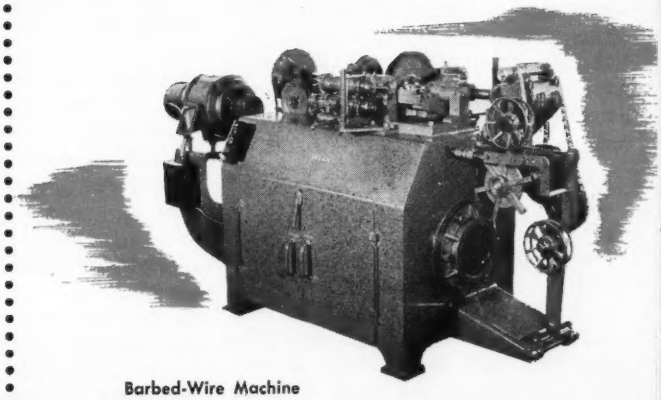

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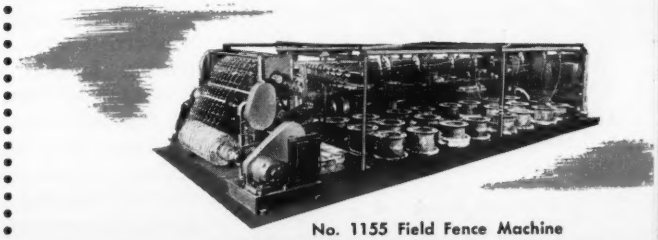

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Potential Markets for Western Wire Fabricators

by Robert E. Oliver
Manager—Commercial Research
Columbia-Geneva Steel Division
United States Steel Corporation
San Francisco, California

This paper was delivered before the Pacific Coast Regional Meeting of The Wire Association by the author on June 12, 1953 at San Francisco, California. In it he describes the growth of the Pacific Coast region for certain types of wire and wire products.

I greatly appreciate the opportunity to meet with you tonight and to discuss the recent trends in the demand for your products and the future outlook for wire fabricators in the West.

★ ★ ★

There are several reasons for my desire to discuss markets at this time. We wire producers are naturally interested in the business outlook for the fabricators since production facilities must be planned well in advance of the need, and recognition must be made of changing requirements in sizes and grades of wires. You, the fabricators, being closer to the ultimate market, must anticipate consumer needs, changes in design, the effects of new products, and the financial ability of the public to purchase manufactured products.

★ ★ ★

During the past several years, we have witnessed a semi-wartime economy that gave a certain stimulus to business. Now, however, we look forward to some cut-backs in military expenditures and a gradual return toward a civilian type economy that is requiring a shift in emphasis in the type of goods produced. In addition, new technological advances and changes in demand, both in the size of the market and the types of products, are requiring all of us to take a close look at past practices and future plans to see if we are keeping pace with the changing times.

★ ★ ★

To recognize the changes that are taking place, we need only look back a few years to see the progress that has taken place. From 1940 to 1951, the nation's steel production of wire and wire products for sale rose 80%, and in the seven Western States, steel wire production for the same period rose 322%. Naturally, these figures also reflect the substantial growth of the wire fabricators, both throughout the nation and in the West.

★ ★ ★

At this point, I would like to define the term "West." Most of my remarks will be confined to the seven states west of the Rockies. However, what I have to say is equally applicable to Colorado and other nearby states normally considered a part of the "West".

★ ★ ★

There's an old saying that "people make markets." When we look at the tremendous growth of western population in the last decade or so, it becomes apparent that the West is indeed a growing market for all products, including wire. The population of the seven western states increased by 5.8 million people, a 50% increase, between the years 1940 and 1951. This is equivalent to adding states the size of Oregon, Washington, Arizona, Utah and Nevada to the western market of 1940. In California alone, population over these years increased 60%—to a figure slightly over 11 million people. It is estimated that by 1960, California's population will be double that of 1940 — or somewhere around 14 million people for the state.

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This increase in population has created a large demand for consumer goods, including houses, appliances, furniture, automobiles, clothing and food. It has provided a stimulus for construction of public and commercial buildings, highways, utilities and public works. Yes, the construction industry has been booming, manufacturers have been increasing production and farm output has been expanding, and the government has been spending huge sums in the West to develop natural resources.

★ ★ ★

This rising economy of the West appears perfectly natural as we look back over the past decade. Back in 1946, however, most people, including many renowned economists, assumed the West would revert to its prewar position in the economy. But the people who manned the West's wartime industries stayed and due to the increased westward migration of population, the West has grown industrially at a rate much faster than the rest of the country. Many eastern manufacturers found that branch plants could be established in the West on a profitable basis, and local manufacturers found that expansion was a matter of necessity if they were to retain their share of the market.

★ ★ ★

While these changes in the growth of the West were taking place, there were shifts in the markets of wire fabricators through-

out the nation which were important to those in the West.

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Perhaps one of the most significant changes, especially from a local producer's standpoint, was the growth of local industry supplanting products which hitherto had been produced in the East and shipped West. Another is the very definite shift toward wires of higher carbon content. This change can be noted particularly in the growth of such products as spring wire, high tensile bolts and fasteners, and wire for prestressed concrete. In addition to the shift to higher carbon wires, there have been shifts in other products due to technological advances in the paper industry, the agricultural industries, the housing field and the construction industry, just to mention a few.

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In order to point out some of the areas in which wire fabricators are finding new potential markets that have excellent growth possibilities, I should like to review several of the past developments in the field of wire and wire products.

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In the automotive field the West is coming of age. Pacific Coast assemblies of cars and trucks rose from 250,000 in 1940 to 650,000 in 1950. In other words, about two thirds of the 372,000 new car registrations in 1940 were locally assembled autos and by 1950 that percentage had risen to 73%. The fabrication of the springs by western plants and the assembly of auto seat cushions have kept pace with this growth.

★ ★ ★

There has been a shift in the past few years from helical spring construction to that of the zigzag spring. This new type spring which gives greater economy and a lower silhouette has been adopted by the majority of the automobile companies. However, western fabricators have met these changes of design and expansion of markets and today the larger share of the automobile seat cushions are fabricated locally.

While we are discussing the uses of spring wire, we should note that the western furniture industry has expanded in proportion to the population increase, roughly a 50% gain in the past eleven years. Not only is this industry now supplying a large proportion of the furniture purchased for western houses but also California styled furniture is being marketed throughout the country.

★ ★ ★

In the electrical industry, rapid advancements in the last few years have opened all sorts of new markets. The tremendous increase in electrification of the West has required the manufacture of equipment which, because of the nature of electricity, uses vast quantities of fabricated wire. Transformers, generators, motors, voltage regulators, switches, relays and meters all require wire in plain and fabricated form. These uses are in addition to the large amount of wire used in transmission and distribution lines. The growth of the electrical generation and transmission field has made possible the use of more electrical appliances, particularly in the outlying areas which could not be served economically until the advent of the REA.

★ ★ ★

In the field of agriculture, wire is also experiencing some changes. The development of small automatic baling machines several years ago created a market for annealed wire in coils. As more of these machines have been put in the field, an increasing amount of coiled wire has been used and the use of old-style hand bale ties has been declining. It is anticipated that the automatic baling machines will soon completely replace the use of hand bale ties for baling the hay crop.

★ ★ ★

We have all been aware of the tremendous number of houses that have been built in the West during the last several years. For the last five years, the total number of residences constructed throughout the United States has been near the one million mark annually. In 1950 the total was actually 1.4 million. The outlook for this year is still around the one million mark, despite the pessimism that existed at the beginning of the year. Roughly 20% of this building has been done in the West with most of it centered in California. In other words, approximately 200,000 homes each year have been constructed in the West. This construction program has made great use of various fabricated wire products including hand and power tools, construction machinery, and other equipment. When the 200,000 homes were completed, they were furnished with many articles using fabricated wire products. Just for a moment, let's take a look at some of the wire products that could be found in the average home.

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The first thing we see as we step in the door is the upholstered furniture in the living room depending on wire springs for comfort. In each house we expect at least one upholstered chair and couch. Then in the two or three bedrooms we might find beds, each using about 50 pounds of steel springs. Suppose we now look in the kitchen. Here we can see cooking utensils made from wire, a toaster with heating wires, a refrigerator with an electric motor using wire and shelves made of wire, an iron with a wire heating element, and electric or gas stove using wire shelves in the oven and wire in the electrical heating element. Looking further through the house we find a wire basket for waste paper, coat hangers, a fireplace screen, window screens, picture hangers, all using wire. If we look out in the yard, we might see a bicycle, lawn furniture, some fencing, a clothes line, a garbage pail, and a few garden tools—all items that use fabricated wire products. Multiply all these items by 200,000 and you can get some idea of the markets that exist for these products in the West. With the continuing population shift to the West, new markets for all these items will continue—and we haven't even considered the replacement market in this discussion!

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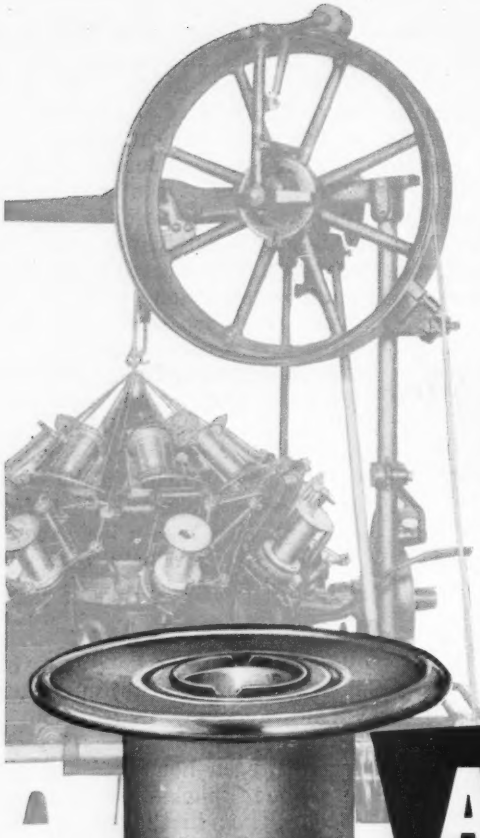

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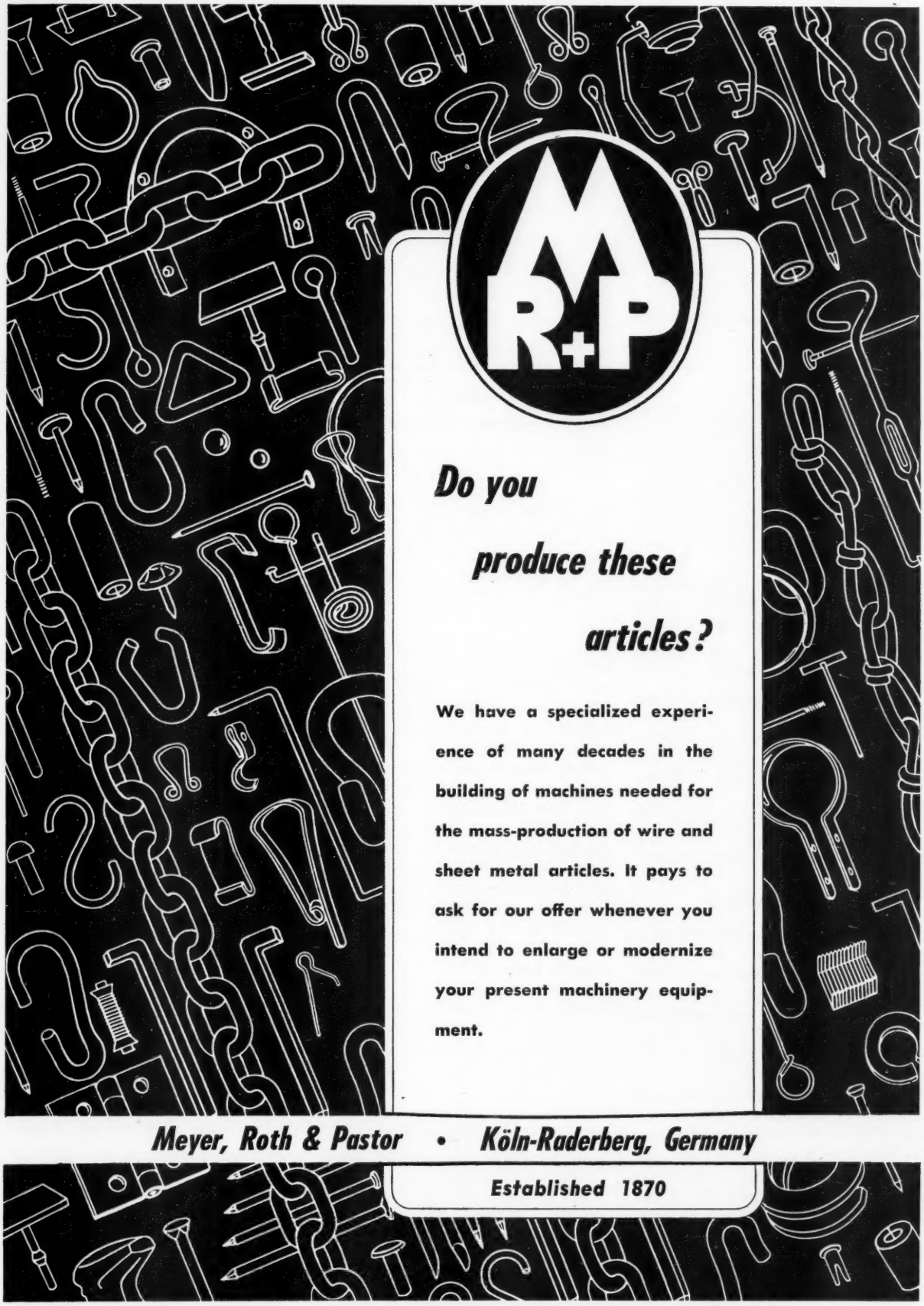
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Get the Most From Your Wire Enameling Dies

by Richard Bliss
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General Electric Company
Schenectady, New York

This article is a down-to-earth treatise on types of dies and how to use and service them. The practical counsel contained in this discussion should help users to turn out better enameled wire at lowered production costs.

The die is a critical part of the equipment used in certain wire enameling operations since it determines the proper thickness of the film applied to the wire.

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The die is not part of the finished product. Its cost and maintenance become manufacturing expense. Failure of the die to fulfill its function correctly can cause wire rejects and machine downtime that result in substantial manufacturing losses in the modern high production enameling shop.

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Over the years a variety of types of dies have been developed for specific wire enameling applications. In order to realize maximum efficiency and minimum expense, the die user should have an understanding of the fundamentals of the dies, their application and proper maintenance requirements.

Wiper Type Dies

The wiper type die, illustrated in Figure 1, is used on vertical enameling towers. Sometimes called the "forwipe" or "dog house" type die, this die was originally developed for use with Formvar enamels. In recent years it has found wider usage in the application of high viscosity conventional enamels to secure a reduction of manufacturing costs by reducing the amount of solvent required in the enamel The wiper dies can be used with most enamels whose viscosity is high enough to support the weight of the die so that it becomes self-centering around the wire.

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Wiper dies are furnished as blanks with the purchaser piercing the blank with the proper size hole to meet his production requirements. The wiper die is essentially a clip formed from spring material to form a die that can be opened to slip around the wire being processed.

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The shape of this spring clip has been selected with certain features which are essential for proper operation of the die. The top of the die is tapered to minimize the tendency of the fluid to collect around the wire on top of the die where it might interfere with the sizing action of the hole in the die. Lugs are provided to support the die on the die fingers on the applicator in such a position as to maintain correct alignment between the die and the wire. A slot in the bottom of the die makes it possible for the die to be slipped around the wire. Thus it is not necessary to disturb the wire setup when changing dies. Two large ports on each side of the bottom allow excess enamel to drain away from the die. The peculiar shape of the bottom provides the tension to keep the upper jaws of the die tightly closed against each other so that there will be no leakage along the top slot. The mating edges of the top jaws are lapped together to form a light-tight joint when the die is closed. Fabrication of the die from thin strip material insures minimum weight to enable the die to float freely on the viscous enamel reservoir in the applicator. This permits the die to center itself around the wire and to cover the wire with a concentric coat of enamel.

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The thickness of the enamel applied to the wire is determined by the annular space existing between the bare wire and diameter of the hole in the die. The size of hole in a die used for producing a particular kind of insulated wire depends on the user's combination of these factors:

1. **Type and physical properties of enamel.**
2. **Bare wire dimensions.**
3. **Oven temperature.**
4. **Wire speed.**
5. **Finished insulation requirements.**

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With these factors in mind the user can develop die size tables on a trial and error basis to meet the requirements of his production. In order to minimize die expense, the user should, over a period of time, refine his original die setups to reduce the number of different

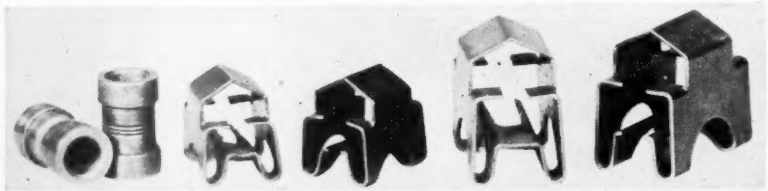

Figure 1—Wiper type dies for vertical oven enameling machines. Small dies in center for Size #15-31 AWG wire. Large dies on right for Size #8-#14 AWG wire. Roller dies on left for horizontal fine wire.

sizes of dies to as small a number as possible. Quite often the same size die on consecutive passes through the applicator will produce the same result in finished wire that would be obtained if a different size die were used on each individual pass. In general it should be kept in mind that increasing size dies will be used with increasing wire size and increasing wire build.

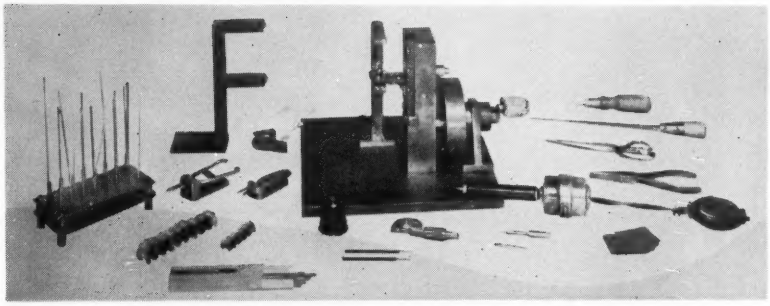

Figure 2—Die finishing equipment. * * * * * * * * * * *

Die Finishing

Die blanks are produced with high production methods which will show some random variation of shape. For instance, it might be necessary for the user to straighten the die blank to get the best fit between jaws on a small percentage of the blanks. This is simply done with a pair of pliers. Any burrs remaining on the edge of the die should be removed with fine grade emery cloth or hand burnishing tools so that the top edge of the blank is smooth and rounded off to a radius of approximately 1/32 of an inch.

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Each die blank should be pierced initially with the smallest possible hole. Once the die wears, the hole may be trued up and used again for the next size die. Thus the useful life of the die may be extended to a maximum by using it over again on larger sizes.

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Over a period of years, a number of simple die finishing tools and devices have been developed for preparing dies for the enameling room. These fixtures are illustrated in Figure 2. The special tools illustrated are of simple construction and many can be made easily by the die user in his own machine shop.

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The die blank can be initially pierced by filing or by drilling followed by filing to size. Small sized holes can be most economically made by filing to required size in one operation while, on large size holes, time can be saved by drilling initially and filing to finished dimension.

A drill jig, such as shown in Figure 3, should be used to insure an accurate hole in the die blank. The tapered top of the die can be shipped into the intersecting slots and the jaws will be rigidly held in place. The lead hole shown in Figure 3 will guide the drill accurately to the apex of the die blank. For best results, the hole should be drilled from the bottom of the die. Jewelers drills of the proper diameter are used for this operation and a separate size hardened drill jig with correct lead hole size, will be required for each size drill used.

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A filing operation is utilized for sizing holes to finished dimension on new dies and for enlarging holes in worn dies so that they can be used again on larger sizes of wire. Here the die is opened up and closed around a file held in the filing machine shown in Figure 2 in much the same manner as the die is opened and closed around the wire on the enameling machine.

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The filing machine, as shown in Figure 2, is a mechanism which is designed to oscillate the die with respect to the file and at the same time permit it to be rotated by hand around the file. The filing machine may be either motor-driven or hand-operated although the hand-operated model is considered more desirable since it gives the operator a better control over the filing operation. On the hand-operated model a smooth, even, continuous motion is obtained with the aid of a flywheel on the hand crank.

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The diameter of the file selected is taken as the diameter of the finished hole size required. Filing the hole is accomplished by the inherent spring tension in the die pressing the jaws of the die on to the file surface as the piece is oscillated along the die by the file machine and rotated around the

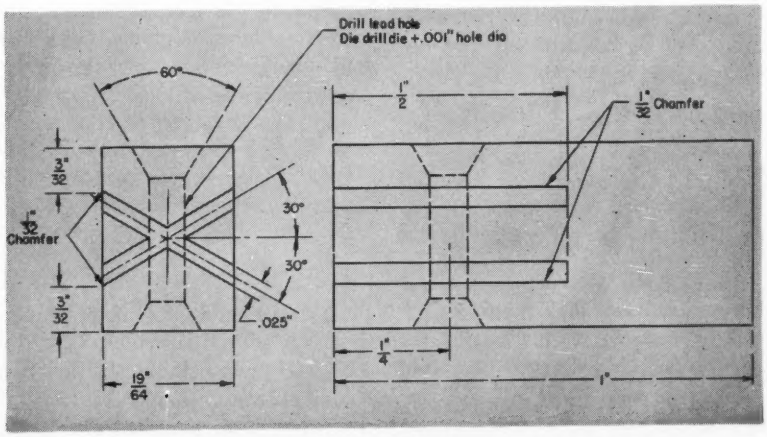

Figure 3—Drill jig for piercing die blank. Drill hole depends on size of drill to be used. *

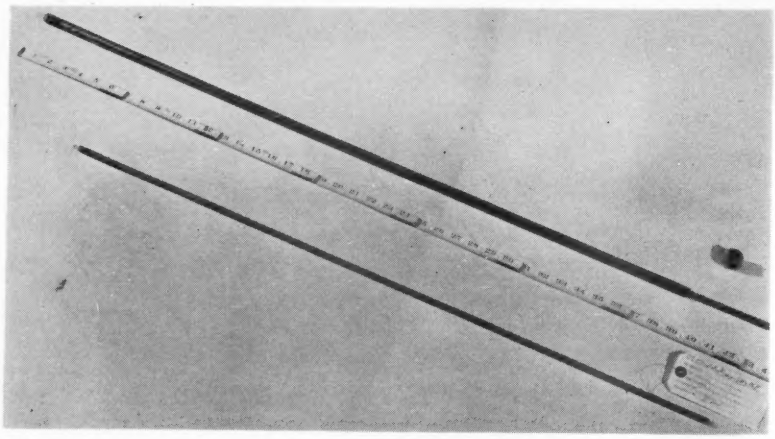

Figure 4—Roller die rod assembly for fine wire enameling machine. * * * * *

file by the operator. Thus a circular hole, centered on the split of the die, can be obtained.

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The diameter of the hole thus produced is measured by slipping the die on a tapered mandrel and measuring, with a micrometer, the diameter of the mandrel immediately adjacent to the beveled top of the die. While this does not give the exact true diameter of the hole, it gives a very close measure which is satisfactory for practical purposes.

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Tapered mandrels of this nature may be easily made up from 1/8-inch drill rod ground to a taper of 0.010 inch to a foot. Two such rods should be made up. Each piece is then cut up into 6-inch lengths which are selected from the two rods so that a series of mandrels with overlapping dimensions are obtained. These mandrels can then be fitted with handles for the operator's convenience.

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After drilling and finishing, the edge of the hole on the underside of the die is beveled slightly to give the hole an effective nozzle shape which is generally believed to aid the die in centering itself around the wire. This is done with a small hand drill with a miniature countersink. Care should be taken that this bevel is not made too large as the size of the hole might be affected thereby.

Upon completion of the finishing operation, each die should be marked with the hole size in a conspicuous position. This marking can be done with an electric vibrating pencil. This type of mark can be erased with emery cloth and a new mark put on in the same same place when the work die is resized for its next use.

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When all operations have been completed, the die should be examined under magnification. All burrs, dirt, and metallic particles resulting from the finishing operations should be carefully removed before storage or release to the enameling room.

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In handling the wiper type die, it is essential that the die not be opened too far. If the die is sprung and loses its tension, it is no longer usable. It is recommended that special reverse-acting pliers be used, both in the die room and on the enameling floor. These pliers should be arranged so that the die can only be opened 1/32-inch more than the largest size wire for which the die was designed.

Roller Type Dies

Certain enameling applications are best served by roller type dies. For instance, Figure 1 illustrates a roller die developed for use with fine wire on horizontal wire enameling machines.

The fine wire roller dies are made with a hole in the center so that they may be slipped onto a piece of drill rod, in the proper sequence of sizes required for a particular enamel setup, to make up a die rod as illustrated in Figure 4. The die rod is fitted into the applicator block on the enameling machine and drive sprockets and chain are assembled so that the die rod is rotated with respect to the wire running through the machine.

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The actual sizing of the enamel on the wire is accomplished by the action of the groove on the circumference of the die acting in conjunction with the tip of a spring finger which rides on the rotating roller die over the groove. The groove in the die is machined to a V-shape with an included angle of 60 degrees. Thus the two sides of the groove, together with the flat side of the spring finger, form an equilateral triangular shaped aperture through which the wire passes.

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Enamel is fed through porting in the applicator to the underside of the rotating die rod, thereby filling the groove with enamel. As the rod rotates, it carries the enamel upward and deposits it on the wire in three streaks of enamel spaced 120 degrees around the wire as dictated by the shape of the space formed by the groove and the spring finger. Surface tension of the highly viscous enamel then pulls the fluid around the wire to form a concentric coat.

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Again, the sizes of dies to be used depends upon the requirements of the particular enameling application, and can only be determined by experiment and experience. These roller dies can be obtained in certain standardized sizes which have been found suitable for most of the enameling operations as we know them today. Each die is stamped on one shoulder with a number indicating the size of the groove. Thus die charts can be readliy made up to meet the requirements of the user's particular enameling operations. Again

it is desirable to select die combinations that result in a duplication of die sizes to produce a desired result in order to reduce the number of different die sizes to be handled and carried in stock.

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The typical horizontal fine wire enameling machine requires 64 dies, one for each line of wire, for a given setup. For the best utilization of the operators and machine time, it is recommended that all die handling functions be handled in the die room or by personnel other than operating people. This can be done by setting up duplicate die rod arrangements for each enameling machine. Thus, if the operator runs into a rough line of wire caused by a clogged die, he does not have to take time to disassemble and reassemble the die rod. Instead he can simply exchange die rods and resume operation with a minimum of machine down time. The defective die rod can then be returned to the die room for inspection and renovation.

Figure 5—Roller die setup for heavy wire on vertical oven enameling machines. Two roller dies at left, when mounted on spring fingers form 1 complete die as shown on right.

Figure 5 illustrates a type of roller die developed for use with extra heavy wire on a vertical enameling machine. Here the complete die is composed of two rollers, each machined so that the aperture formed by the two rollers is hexagonal in shape. The principle of application of enamel is much the same as for the fine wire roller die with the triangular shaped groove.

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Each roller in this type of die is free to slide back and forth on the two pin fingers while at the same time the fingers themselves are free to swing in a circular path enabling the dies to shift in response to any movement of the wire, thus maintaining correct alignment between the die and the wire being coated. The two parallel fingers are also free to open and close to permit kinks and brazes to pass through the die without causing damage or disturbing die lineup.

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Successful operation of this die depends a great deal upon keeping the die components free and clear of enamel so that the various parts do not gum up and stick. This can be accomplished by lubricating the die occasionally during operation with a solution of enamel thinner applied with an ordinary oil can.

Cleaning Roller Dies

Upon receipt in the die room, the die rod, or die fingers, with dies mounted, should be soaked from 24 to 48 hours in a thinner solution to soften and dissolve accumulated enamel and dirt. At the end of the soaking period, the dies should be carefully brushed with a wire brush made of very fine steel wires, on the order of 0.002 inches diameter. A fine brush of this sort will reach into the fine grooves on the die and clean out much of the dried enamel, copper dust or dirt which might be accumulated and which would prevent the die from properly performing its function of coating the wire.

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After the initial cleaning, the die rod should be examined under magnification, preferably with a magnifying comparator, where the profile of each die can be checked against a standard profile silhouette. This will very quickly show up worn and dirty grooves requiring attention by the die room people. This type instrument greatly speeds up roller die servicing operations since the image of the die is thrown on a large screen readily visible to the die maintenance operator.

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The die rod is rotated by hand as it is inspected under the comparator so that the entire length of groove is seen. A very fine camels hair sash brush can be used to clean lint and loose dirt from the grooves. Encrusted materials such as dried enamel can be removed with a pick which can be easily made up from a piece of piano wire ground to a fine point and fitted with a small handle for convenience.

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As the inspection progresses, defective dies worn beyond further usefulness are marked with a piece of chalk. When the inspection and final cleaning is completed, the rod is disassembled and the rejected dies are replaced with new dies which have been previously inspected. Each die and the die rod itself should then be thoroughly washed in trichlorethylene.

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The inspection being complete, the dies are then assembled on the die rod in the proper sequency demanded by production requirements. Due to manufacturing tolerances of the die, and the effect of the accumulation of these tolerances, it becomes necessary to insert shim washers at various points along the die rod to maintain the correct distances between the center grooves to the roller dies. These distances are quite important since, if the grooves are too far out of alignment with the sheaves on the enameling machine, the wire will tend to ride up and out of the groove. Incidentally, it is the function of the additional grooves on the die to catch the wire should this happen. While the die can be lined up with the wire to ride in either outside groove to prolong the life of the die, it is best to use the center groove as often as possible.

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It is recommended that die rods be permanently assigned to a particular enameling machine, and at all times, except when on the applicator, the die rod should be identified with a service tag bearing pertinent data relative to that rod, such as enameling machine number, die sizes, die position, date, etc. Records can then be kept on die usage, reasons for defects, etc. and abnormal die expense resulting from unusual conditions

(*Please turn to page* 812)

Influence of Heat Treatment on the Properties of Drawn Steel Wire

by Hermann Weil

This article, translated from German for us by Dean Jerome W. Howe of the Worcester Polytechnic Institute, appeared first in the November and December issues of Draht-Welt and is reproduced here by permission. While much research work of this nature is done on this side of the Atlantic, it is interesting to note from time to time the results obtained from studies and experiments conducted in other parts of the world.

The heat treatment employed in the manufacture of steel wire aims at various ends. Thus low carbon wire (iron wire) was annealed in order to increase still further the strengthening caused by the drawing, while with higher carbon wire globular cementite in the structure is obtained. Steel wire with medium and higher carbon content, in which it is desired to produce special mechanical properties, is patented; one tries thus to achieve a certain definite final strength and a specially appropriate structure both for the drawing process and the properties subsequently desired. Two patenting processes are chiefly employed, namely, lead or salt-bath patenting and air-patenting.

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Steel wire with much laminated pearlite in the structure, according to experience, permits in the process of drawing essentially less diminution of cross-section than is the case with patented wire with sorbitic structure. Moreover, the form in which the sorbite appears affects the mechanical properties, and researches which have been carried out with steel wire with strengthened structure have proved this. Differences in the bending and torsional values determined for lead-patented and air-patented wire make it apparent likewise which significance is to be assigned to the improvement of the structure before drawing.

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In order to learn about the influence of the heat treatment upon the properties of steel wire the following rsearches attempted first to investigate the change in structure by lead-patenting, and then the control of the mechanical values after drawing by various patenting temperatures. Moreover it was more than proved how a preceding annealing process affects the drawing, and finally ascertained if an intermediate annealing can be substituted for an intermediate patenting. The experiments were carried out with basic S M steel of which the composition is given in Table I.

Table 1

Steel	C	Mn	Si	P	S	Cr	Cu
1	0.48	0.40	0.14	0.015	0.030	0.068	0.19
2	0.74	0.51	0.17	0.015	0.034	0.095	0.20
3	0.34	0.52	0.19	0.037	0.045	0.074	
4	0.53	0.56	0.19	0.036	0.036	0.088	
5	0.69	0.45	0.13	0.015	0.035		

Change of Structure by Lead-patenting

In order to get a picture of the change in structure, isothermic change curves of Steel 1 and 2 were taken by pairs of different heating temperatures. The time-temperature-metamorphosis curves could be evaluated immediately in the special case of patented wire, as the manner of their determination accords generally with the conditions in industry.

To this end, sections of cut-off wire 5½ mm. diam., 40 mm. long were austenitized in an electric oven under the most precise temperature control by 800° and 920°, then brought into a lead or zinc bath of definite temperature and after a determined interval tempered in water. Previously the austenite structure was ascertained by hardness test. The duration of both austenitizing temperatures was sufficient as determined by experiment for complete setting free of ferrite.

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The curves in Fig. 1 show a

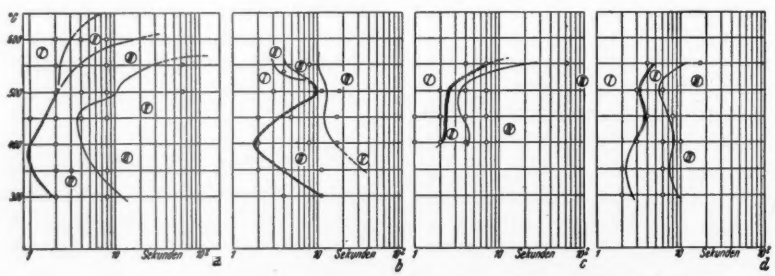

Fig. 1. Isothermic Change Curves for Steels 1 and 2. (seconds plotted along X-axis)

good agreement with curves of similar steels. The second minimum of the austenite stability, which by curves b and d occurred at about 350° to 400°C. should be attributed to a contamination of the steels with foreign elements, particularly chromium. A certain difference appeared in regard to the pre-precipitation of ferrite. Besides the known fact that in a certain temperature range pre-precipitated ferrite is during a short interval next to austenite in stability, it could yet be observed that also by a lower temperature the disintegration of austenite sets in with a precipitation of ferrite, of which the duration must of course be brief, for the remaining austenite disintegrates immediately into sorbite.

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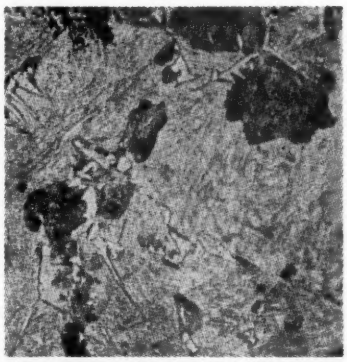

Fig. 2. Steel 1. Austenitized by 920°; tempered 12 seconds in zinc bath from 300° and finally in water. (Magnification x 380.)

* * *

These observations were made on both the steels under investigation, whereby it was ascertained that the quantitative portion of ferrite decreases by equal temperature losses as well as with increasing austenitizing temperature, as also with increasing carbon content. A eutectoid steel should therefore exhibit no precipitation of ferrite. It is accordingly to be supposed that with respect to the steel composition and the rate of cooling (influenced by the lead bath temperature) in medium carbon steels, as also by means of increased rates of cooling, still more pre-eutectoid ferrite can be caused to appear. The displacement of the isothermic change curves through raising the austenitizing temperature is clearly noticeable with both steels. The development of the pearlite or the sorbite structure is not so different or clear that unequivocal conclusions can be drawn from the relatively narrow range of temperature (800° to 920°) investigated.

The Influence of Patenting Temperature and the Patented Structure on the Control of Mechanical Properties

Since steels of medium carbon content could exhibit preeutectoid ferrite, it was desirable to investigate in what manner the drawing and the mechanical properties were influenced by greater proportions of ferrite and eventually also of pearlite.

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These experiments were carried out with 50 kg. wire rod rings of 5½ mm diam. which had been lead-patented in the industrial manner in a continuous oven. The temperature could be kept equal to the austenitizing temperature. It could at times be changed through a certain interval, while the lead bath temperature remained constant. The heat treated wire rod was, after pickling and rinsing, finally further drawn by single draft under constant conditions. After each draft a considerable length of wire was cut off for purposes of test, and some days later their mechanical properties were determined. Table 2 contains data of the increase of tensile strength for given draft conditions, also data re the quantity of ferrite, and statement whether the heat treatment was over or under the Ac3 point.

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After a reduction of the cross-section of 82½% the percentage increase of tensile strength of Steel 1 is determined to be considerably lower with the higher austenitizing temperature than with the 720°. The contraction and elongation was practically not influenced by the austenitizing temperature. On the other hand an influence was noted upon the bending strength (flexibility). As far as the temperature remained below the Ac3 transformation, the structure therefore containing ferrite and eventually pearlite, the flexibility reached an essentially lower value, as this is the case after exceeding the upper transformation temperature. These higher austenitizing temperatures are noticeable not only through a rapid rise of flexibility after the first drawing, but with equal reduction of cross-section the final strength is strongly influenced. Also the torsion coefficient, which in the patenting state is highest with the lower oven temperatures, is in the cold-drawn state dependent upon the austenitizing temperature, for it reaches with equal cross-section reduction the highest values with the highest temperatures.

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Quite otherwise with Steel 2. Here the increase in tensile strength remains practically the same through oven temperatures (see Table 2) as soon as the upper transformation temperature is passed. The behavior of the contraction and elongation values is similar to that of Steel 1, the influence of the oven temperature not being appreciable.

Table 2

Steel	Pat.-Temp. Oven/Lead °C	Position of the austenitizing temperature	Initial-final tensile strength kg/mm		Approx. Ferrite %	kg/mm²	% increase in strength
1	720/510	under Ac 3	88.3	152.0	15	63.7	72.5
	775/510	over Ac 3	97.2	143.5	1	46.3	47.5
	840/510	over Ac 3	96.1	150.5	1	54.4	56.5
	920/510	over Ac 3	97.5	153.5	1	56.0	57.5
2	720/510	under Ac 3	117.5	175.0	2-3	57.5	49.0
	775/510	over Ac 3	128.2	190.4	0	61.8	48.2
	840/510	over Ac3	129.0	194.0	0	65.0	50.5
	920/510	over Ac 3	129.0	194.0	0	65.0	50.5
3	annealed 700	-	49.0	96.0	100	47.0	96.0
4	annealed 700	-	56.0	118.0		62.0	111.0
5	annealed 700	-	57.0	125.0		68.0	119.0
3a	900/510	over Ac 3	79.0	135.0	20	56.0	71.0
4a	900/510	over Ac 3	106.0	165.0	1	59.0	56.0
5a	900/510	over Ac 3	121.0	181.0	1	60.0	50.0

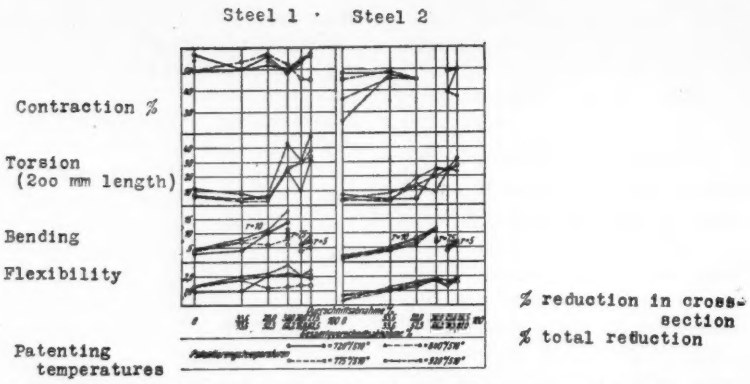

Fig. 3—Mechanical values of Wire of Steels 1 and 2 with different austenitizing temperatures in the patented condition and after drawing.

The flexibility coefficient shows correspondingly an increase in value up to about a 66% cross-section reduction, which, however, decreases with further cold-working; but increases however with the last drawing. The final value, with an exception (775°/510°) is the same for all austenitizing temperatures. The torsion coefficient shows after the first reduction of cross-section either an insignificant increase or even a falling off in value, which however increases perceptibly after further cold-working; the greatest final value, however, agrees for this steel not with the highest oven temperature, but is reached through an austenitizing temperature of 720° (Fig. 3).

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For both steels therefore, within the investigated austenitizing temperatures, no substantial influence of the oven temperature upon the tensile strength after cold-working is noticed, if the upper transformation temperature is exceeded. Neither does a change in oven temperature affect the elongation or contraction to an appreciable degree; on the other hand, however, increase in value of the flexibility as well as the torsion coefficient is to be observed.

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In Table 2 for Steels 1 and 2, as well as 3a, 4a and 5a, the quantities of non-eutectoid ferrite are given for different patenting temperatures, some over, some under the Ac3 temperature. For Steels 3, 4 and 5, the distinction between pre-eutectoid and eutectoid ferrite is no longer possible, as a ferritic ground-mass exhibits a more or less uniform cementite. On the whole it seems that a high percentage of strengthening is always associated with a higher content of free ferrite. It seems permissible to assume that not only the free ferrite but also the pearlite-sorbite structure contributes to the strengthening. Hereby however the role that the cementite plays in the drawing should not be forgotten (see later). But also it is interesting to observe the reduction of cross-section, which does not correspond with a simultaneous increase in tensile strength (Fig. 8) although the wire experienced a distension as the views of structure (Figs. 4 and 5) clearly show.

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As the initial structure exerts a noticeable influence upon the several mechanical properties, it was essential to obtain further facts, through change in structure, in order to be able to draw final conclusions about the influence upon the mechanical properties. Accordingly the following experiments upon the annealed steel wire were also undertaken in order to investigate the influence of in-between annealing instead of in-between patenting upon a subsequent patenting.

Influence of Annealing Upon the Subsequent Patenting of Steel Wire

The mild annealing of steel wire takes place ordinarily only with carbon steel wire, where an annealed structure is desired for further working, as for example wire for needles, or where the structure will not permit of cold-drawing, as for example wire rod of high carbon steel with primary cementite in the structure. In the manufacture of patented rope or spring wire, on the other hand, in-between annealing is not usually employed. It was accordingly of

(*Please turn to page* 819)

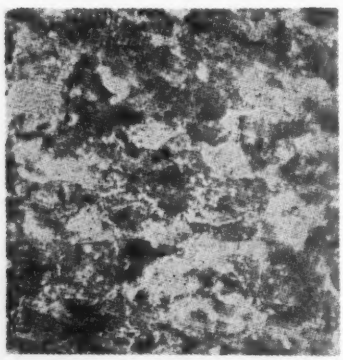

Fig. 4—Steel 2 patented by 720°/510°; structure after the first draft. Diam. of wire 4.47 mm. (Magnification x 380.)

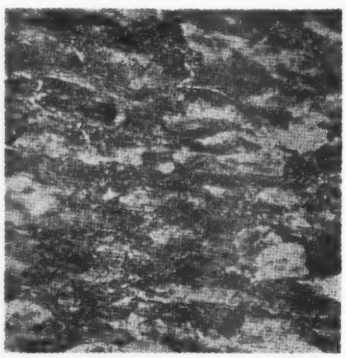

Fig. 5—Steel 2 patented by 720/510°; structure after the second draft. Diam. of wire 3.8 mm. (Magnification x 380.)

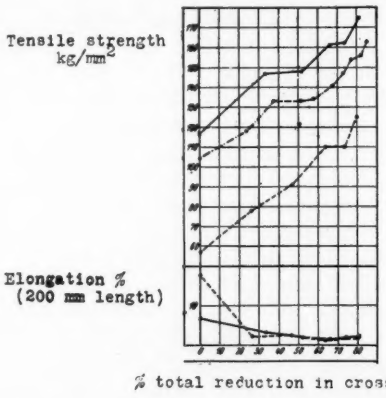

Fig. 8—Example of deformation by drawing without gain in strength.

Wire Rope From Youngstown Yolectro Rope Wire Proves Extra Strong in Service

When this walking dragline scoops up a 6-ton load of earth in its drag bucket, the strain on the wire rope is tremendous. Ability to withstand this punishment year after year is why Youngstown Yolectro Rope Wire stays on the job at this Pennsylvania coal strip mine.

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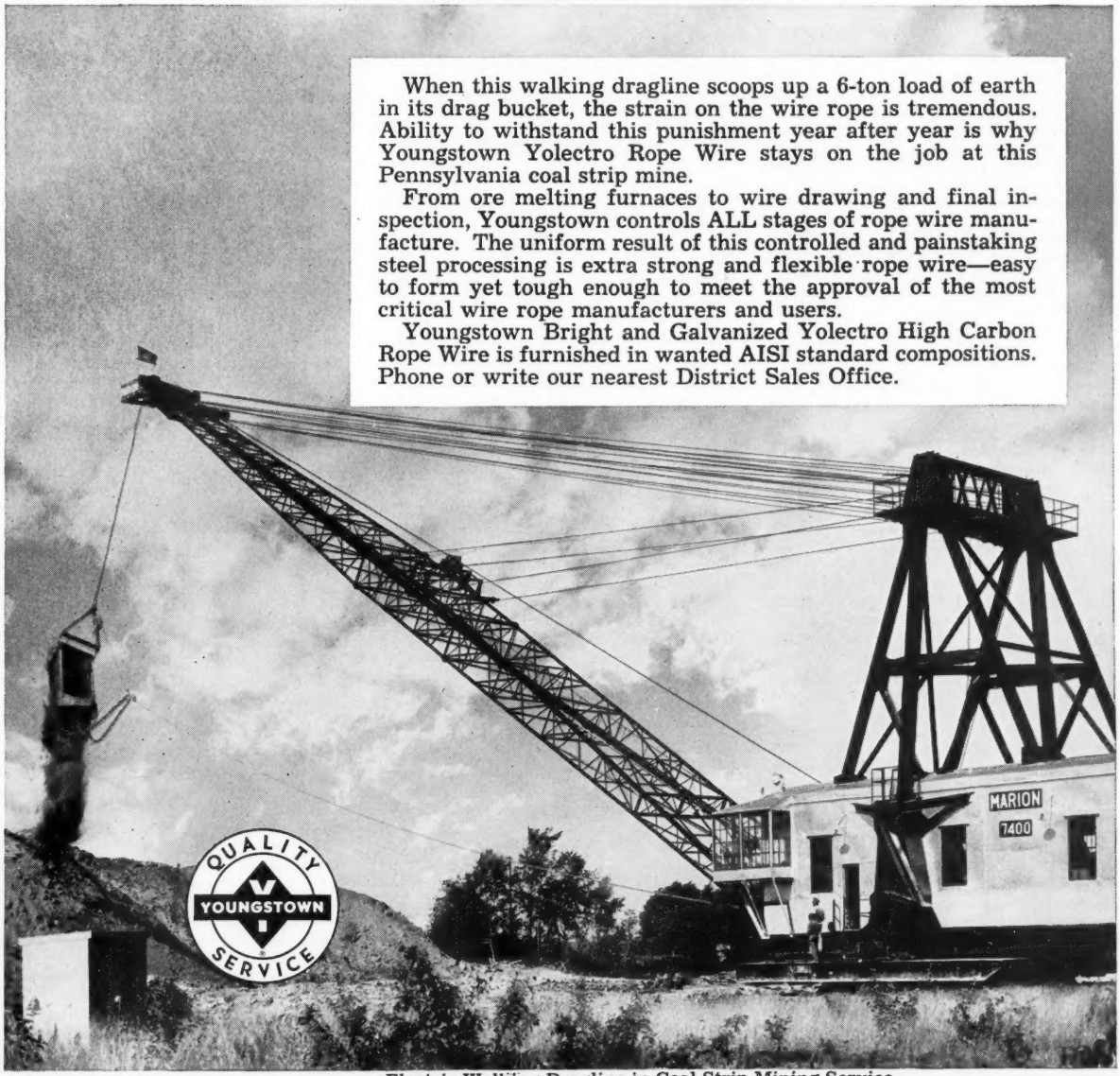
Youngstown Bright and Galvanized Yolectro High Carbon Rope Wire is furnished in wanted AISI standard compositions. Phone or write our nearest District Sales Office.



Electric Walking Dragline in Coal Strip Mining Service at Buckeye Coal Co., Grove City, Pa.

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Inhibitors vs. Accelerators
A Symposium

Moderator: Allan B. Dove, Steel Company of Canada, Ltd., Lachine, Can.

Panel Members

W. Billingsley, Canadian Industries, Ltd., Montreal, Can.
J. T. Irwin, Poor and Company, Waukegan, Ill.
Alfred Douty, American Chemical Paint Co., Ambler, Pa.

DISCUSSIONS

MODERATOR DOVE: Just as an addition to what these gentlemen have said, one accepted formula for the power of inhibition was that inhibiting power was equal to:

$$I = \left(\frac{M}{16}\right) 1.83$$

and those were supposed to be the best inhibitors. I wonder what the gentlemen on the Panel think about it.

MR. BILLINGSLEY: I think, in general, that that is possibly true.

MR. DOUTY: I agree. Of course, almost always powerful inhibitors are substances of high molecular weight, though there are exceptions—I wouldn't consider the pure substance diorthotoluene thiourea to be of high molecular weight, yet it has a fairly high inhibitive power when properly dispersed in the bath. Of course if we come to the cyclical basis, we find that the ones of most complicated structure usually furnish the most powerful inhibiting power. Our Company has in late years used basic materials of that kind as raw materials for further reaction in introducing inhibitors. We haven't been using them in that form. The most powerful inhibitors in use today contain nitrogen and sulphur, usually, but not always.

MODERATOR DOVE: Would you say a toner could . . .

MR. BILLINGSLEY: There are special restrictions to the use of toners, as far as you are considering them.

In the first place, one type of toner, let's say, is merely a surface-active material which has the property of both giving penetration of the acid into and between oily surfaces and secondly of causing the acid to flow off the surface well, which has also something to do with the way that this surface-active material was adsorbed on the surface. However, I have heard—and I would welcome discussion on this point—that in some instances difficulties have arisen among the wire manufacturers because of the carry-over of surface active material into their lime tubs. I have heard that not infrequently they experience a coagulation of the lime in the tubs that causes a poorly adherent lime coating. You ask me about limitations—this is one type of limitation, one type of reason that we don't always use the two inhibitors; why we add them separately.

MODERATOR DOVE: What would you reply about that, Joe?

The presentations of the panel members were published in the July issue of Wire and Wire Products, along with other technical papers delivered at the Montreal Regional Meeting of the Wire Association. This portion of the symposium embodies the further comments of the panel members' questions from the floor and the responses.

MR. IRWIN: I was just thinking that I am in a spot because in talking of films on steel, we don't produce any film on steel with a depolarizer, so it is not quite fair to talk about them. But I have seen installations in strip galvanizing where surface films formed — I don't know specifically whether with toners or inhibitors—but something had plated out on the work and had to be removed rather strenuously with a nitric acid bath and rinsing and scrubbing prior to going into the electro-galvanizing bath, because that film did interfere with adherence.

MR. DOUTY: I agree with you. We recognize that there is a considerable hazard in the indiscriminate use of inhibitors in the pickling of metal which is to be electroplated, without a considerable number of cleaning operations to follow. I would not recommend the use of inhibitors in the acid department immediately preceding a plating operation. If the steel were cleaned in the usual immersion and electro-cleaning operation and rinse, the last thing you do is give a quick acid dip and a quick rinse in that rinse. I think it would be highly hazardous to put inhibitors in unless it had been tested for application in the plant.

MR. BILLINGSLEY: We don't manufacture or sell pickle toners, but I have met pickle toners in my experience on many, many occasions. I don't feel that I am particularly qualified to talk about them. The only thing we have that is close to that is we do, in certain instances, recommend the use of surface-activators and they take the form of something like sodium alkyl aryl sulphonate, a type which has a high detergency. It is relatively or comparatively cheap—one of the cheaper types of surface active agents—and it does a reasonably good job and also has inhibiting qualities that are incidental to this discussion.

MODERATOR DOVE: That is the extreme right, opposed to Joe's idea of a non-inhibiting or accelerating quality with surface activation.

MR. IRWIN: Not surface activation; surface active agents do tend to accelerate the action of the pickling bath purely by the wetting functions; and it has been used for some time to some extent, but chemical depolarization is not a case of wetting out the steel. We have been using in particular a material which becomes colloidal in nature in the bath and we know we have evidence there is a reaction between it and the nascent hydrogen formed on the surface of the steel in the pickling action and it tends to release that hydrogen on the surface. It is not in any sense a surface active agent.

MR. DOVE: In the use of the accelerators, the first thing we could notice is that the bath turns a slightly different color. There is a great deal more flocculent precipitate in the bath and sometimes the wetness of the material appears to have been reduced by a thinner film—and that is why I asked about the wetting agent.

I might say in defense of the acceleration theory, that we tried it out in continuous lime pickling for galvanizing and I have worked out yields, just how much it had reduced the dross formation in hot galvanizing. That is one thing—and I don't know whether anybody has investigated that end of it. We found that it reduced our dross consumption very roughly about 11%. Now, we were using it in the continuous bath immediately in front of the spelter, and we put it in, having two cleaning baths, with the wire travelling at about 150 feet a minute. We put it in the first bath and there was enough carry-over to build up a concentration in the second bath—the baths came one after the other—and then it went on into the spelter after that. And over a four month trial period up until the end of last month, we had reduced our by-product dross weight by about 11%. That meant that the cost of the addition was very much less than the saving; it worked out that for 20c you saved $1.65; that is not too bad.

So if you gentlemen on the floor now want to start popping questions at these fellows, I think they will love to have them.

I noticed one thing that we must all keep in mind—all inhibitors do not give the same results under all conditions. I think you will all agree on that; so

you must be careful in stating some definite practice—and especially in publication. There was one article in WIRE AND WIRE PRODUCTS that I went over rather carefully, finding that the gentleman had based his studies on one particular type of metal and on one only. He made his comparisons of all these inhibitors on the basis of that one metal, yet the conclusions presented were drawn in general. I don't think we can do that. All of you know and will find that in your plant one single inhibitor under certain operating conditions works better than another. That is the only reason there are so many fellows in the inhibitor business. But that seems to be a point that I think is worth while bringing out. A general all-purpose inhibitor on, say, a high-low carbon mill—one running both—may be quite different from one that Jim would want to use here on stainless, if he were doing low stainless types. And so, in our case, in our particular mill, I am concerned with high and low carbon operating through the cleaning line; therefore I sometimes have to give up some advantages on one side to get them on the other. How about it?

MR. DOVE: How about your experience on this, fellows? How about you, Dan?

A MEMBER: I agree with Mr. Dove. We have the same conditions, low and high carbon, different grades of steel. We only tried a couple of different inhibitors and we found that this particular brand was giving very good satisfaction; then we made a change and we tried another brand and we found the same as you did—that we would have to sacrifice one point for some other point; but I would like to know why. What is the cause? It is supposed to be the same.

MR. DOVE: As Dan said, he tried one inhibitor and it worked fairly well; and another one didn't work as well and he doesn't know why.

A MEMBER: We used "A" inhibitor and the cleaning ran from 65 carbon to 40 carbon—some is annealed wire and some is patented rod. Then we got another inhibitor and it may be practically as good as the "A" inhibitor, but at some point it wouldn't work as well. You will either have a foaming condition in your lime tank or something like that.

MR. BILLINGSLEY: What Dan is referring to is a condition that I can't explain. It has been mentioned before—it was where he got an intermittent foaming in his lime tank when using another inhibitor. His rinsing was good; there was very little surface effect in the inhibitor to start with. I would say it would be 1% or less of the total weight of the inhibitor and you experience this intermittent foaming sometimes. It may have been due to a human element. Was it in the inhibitor? I don't think it was, because there was very little in there and when you figure out the amount of inhibitor in the tank and the fact that you get good rinsing in between, the amount in even milograms on a gauge coil of wire would be very, very small and not enough to cause excessive foaming; yet it happened.

MR. IRWIN: Do you suppose that one inhibitor had more of surface active agents than the other, that would carry over into the lime and then become effective as a foamer in the lime tank?

MR. BILLINGSLEY: I don't think there was enough to go over. There could not have been any more than 1% difference, even if the other inhibitor had none at all.

MR. DOUTY: I find that phenomenon hard to explain; but all foaming problems are hard to explain. For example: there are agents which may be added to a pickle bath to produce a foam and which produce a strong foam, but which in the presence of other foaming agents in the inhibitors, may completely suppress the formation of foam by the first foaming agent. Now, I don't know exactly what happened there; but it sounds as though we had a drag-over which caused an intermittent foaming and then precipitation of the foaming compound. This sounds very much like a colloidal reaction—something built up and then absorbed—a colloidal material—and then precipitated out. I couldn't say what substance it could have been, but I have had evidence of unexplainable things like that once in a while.

MR. BILLINGSLEY: Have you ever experienced foaming in a lime tank?

MR. DOUTY: It has happened.

MR. BILLINGSLEY: I meant for things that you did relate to the inhibitors or that you thought might have been related to inhibitors?

MR. DOUTY: No.

MR. BILLINGSLEY: Well, I haven't in twenty years.

A MEMBER: You were wondering if you could get any inhibitor over into the lime bath. We were doing a lot of experimenting with inhibitors and we got up on type and we put it in our acid; when we started drawing the thing, the whole room started to fill up with nice blue smoke with a witch hazel smell to it. We changed back to one of our other inhibitors and we didn't have it. One particular inhibitor was carrying through and the only thing we could attribute it to was that other inhibitor.

MR. DOVE: It is completely possible that the inhibitor was insoluble in water.

A MEMBER: If it is a good inhibitor it is supposed to fade out, and it is supposed to be doing its job.

MR. DOVE: I have tried probably at one time or another something around twenty-eight different inhibitors. I have had them come from England, from Germany, from the States and from Canada; to my mind, under particular conditions, they do not all work out the same. Many of the standard inhibitors you can take one or the other and then you come down to cost, deciding which one you will use for general purposes. Has any one here a predominantly carbon mill? If so, how do you find it—what inhibitors would you find you could use?

A MEMBER: I don't know how to describe the general type chemically, but we have changed back and forth between several different brands a number of times. We finally come back to one, I think probably this should be off the record. (Off the record discussion.)

MR. DOVE: The use of water which is high in organic material may change your inhibitor quite considerably. For example, down here on the Island of Montreal the water comes down from the Ottawa and the St. Lawrence and joins at the end of the Island. The water coming down from the Ottawa is highly organic, whereas in Hamilton the waters are very highly alkaline due to limestone areas down there. As a matter of fact, the hardest water in Canada is right down around Toronto. So there is a condition right there where with the same inhibitor, with the same strength of acid, the water said, "No." How do you find that, yourself, Bill?

MR. BILLINGSLEY: I think this should be off the record, too. (Off the record discussion.)

MR. IRWIN: Types of water can not have any particular effect on acceleration, as we use it. Primarily this is because the one currently used is a colloidal particle; it is not coagulated or acted upon physically or chemically by anything in the water. Conversely, the wetting agents of various types used as surface tension depressents are well known for the fact that some of them tend to precipitate out in calcium and magnesium waters. I don't know but I just suggest this: some of the various organic compounds used as inhibitors may possibly tend to precipitate out and form lime or magnesium salts that are no longer effective as inhibitors in that bath. That may be one good explanation why Parkin's products will work in one plant. Douty's in another and Billingsley's in another. If they try to interchange, they may lose out.

MR. DOUTY: It may be true that different kinds of inhibiting substances might be more desirable under different conditions. We certainly might recommend a different type of inhibitor in some galvanizing shops than in some other rod picklers that are wire pickling operations. We make, as an actual matter of fact, about six different things that are completely different in their chemical nature, yet are under the name of our brand. We make solid inhibitors in which the principle active ingredient exists largely as a fine colloidal suspension of solid particles; we also make liquid inhibitors that are completely water and acid soluble and not readily driven out of solution by the accumulation of iron. We make other classes of inhibitors, among the most powerful of all, in which the substances are suspended as very fine colloidal liquid particles. Now, the chemical differences among these things are very great, and the point that I am making is that if any condition arises where organic matter—organic matter or mineral content of the water—exerts an influence on the effectiveness of the inhibitor, it ought to be able to be overcome by changing the type. However, I am interested to hear this whole discussion because I have no quantitative information on the actual effect of these various agencies that you have mentioned—for example, organic content of water.

The organic content of water usually is of two kinds: one is things extracted from dead vegetation, such as phenolics; the other is industrial wastes from sewage. There can be of considerably different types, but most natural water supplies contain very little of these substances or they would be extremely obnoxious; therefore, I am at a loss to quantitatively explain the effect of those organic things.

MR. DOVE: I think this brings up one point for the inhibitor manufacturer—a

(*Please turn to page* 835)

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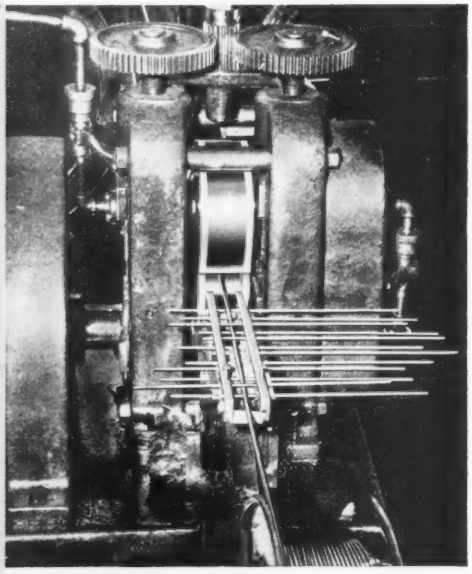
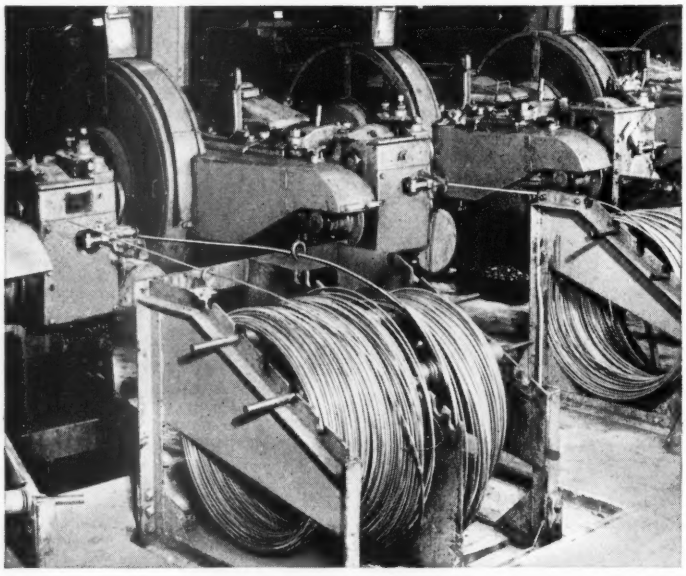
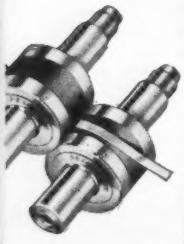




Wire flattening rolls operate 22 months without spot change



Carboloy Wire Flattening Rolls do a high-precision, lustre-finish job; outlast steel up to 40 times. Steel rolls formerly used to flatten stainless steel wire into textile loom reeds required spot changes every two weeks. Carbide rolls flattened wire on the same spot for 22 months, with wear almost nil. Records reveal less rejects, finer finishes, important manpower savings.

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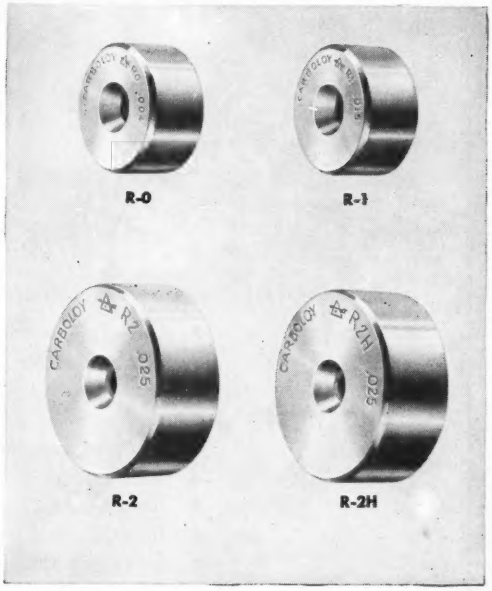

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- Wire problems from a sales manager's point of view.
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- ***Processing of phosphor bronze wire.***
- ***Titanium wire—its processing and uses.***
- ***Applications of paper to electric wire and wire rope.***
- ***Description of a new cable for open wire and cable circuits.***
- ***A new method of fine wire manufacture and packaging.***
- ***The uses of fluorothene in insulated cable.***
- ***The continuous casting of aluminum rod.***
- ***Some results of research on insulated wire.***
- ***Properties and uses of Neoprene in electric wire.***
- ***Visit to Hawthorne Works of Western Electric Company.***

Note: The first three papers in the "ferrous" list will also interest non-ferrous men.

OTHER FEATURES

Annual Luncheon at which the Mordica Memorial Lecture will be delivered and awards for meritorious papers made.

The annual business meeting of the members of The Wire Association.

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RICHARD E. BROWN, ***Executive Secretary***

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Government Wire Production Information

New Nickel Contract Signed

Signing of a contract looking toward the production of up to 56,000,000 pounds of refined nickel from an undeveloped deposit in British Columbia has been announced by the Administrator of DMP.

★ ★ ★

The new project is to be undertaken by Western Nickel, a wholly-owned subsidiary of Pacific Nickel Mines Limited, Vancouver, and Newmont Mining Corporation, New York, and will involve expenditures possibly totaling $4,750,000.

★ ★ ★

At its own expense, the company will continue exploration of an ore body in the Yale District of British Columbia, about 100 miles east of Vancouver. This work, begun on October 1, 1952, is to be completed by September 30, 1953, and is expected to cost, in all, about $425,000.

★ ★ ★

Upon completion of the exploration program, the company will proceed immediately with the development of the property for large scale mining. The work is to be completed by May 31, 1954, and is expected to cost $750,000.

★ ★ ★

Upon completion of the development program, if the company and the Government agree to go ahead with production, the Government will advance up to $2,625,000 and the company will put up $950,000 of its own funds for the necessary facilities.

★ ★ ★

Production is scheduled to start March 1, 1955, and is to continue at the rate of 6,000,000 pounds of refined nickel per year for the next seven years. The contract provides that all of this nickel — a total of 42,000,000 pounds—will be sold to the Government. The Government will pay the market price, time of delivery, f.o.b. Port Colborne, Ontario, but will accept delivery at the Fort Saskatchewan plant of Sherritt Gordon Mines Limited in Alberta. Sherritt Gordon will do the refining.

★ ★ ★

Should production run over 6,000,000 pounds a year, the company has an option to sell to the Government an additional 2,000,000 lbs. a year, and the Government has an option to buy an additional 1,000,000 pounds a year, in the event the company does not exercise its option. These options run for seven years at market price or 56½ cents a pound, f.o.b., Fort Saskatchewan, whichever is higher.

★ ★ ★

New production of nickel now provided for under DMPA expansion contracts with private producers will total approximately 562,000,000 pounds over a 10-year period. Annual United States consumption of nickel before Korea was about 200,000,000 pounds, but

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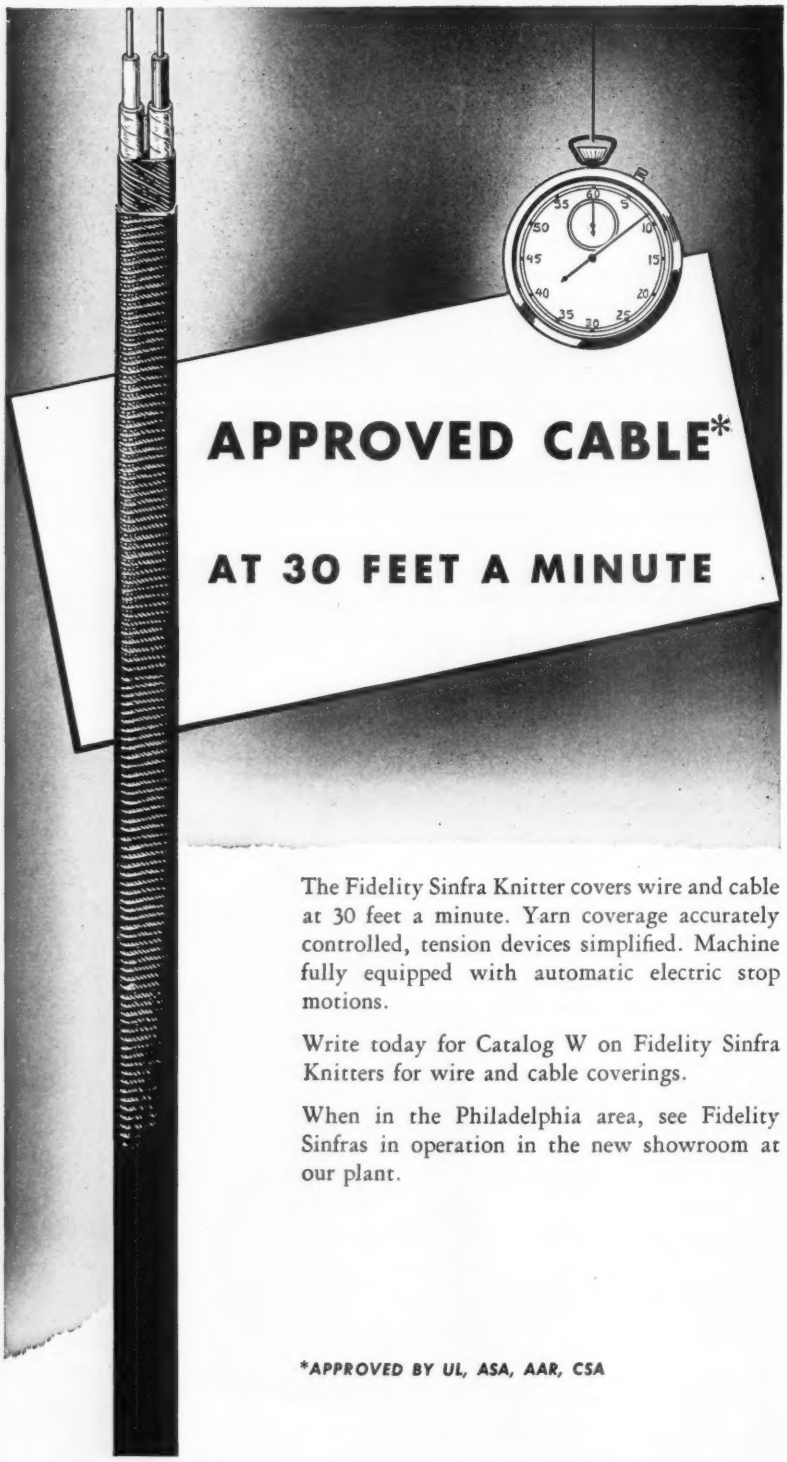

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Old Arizona Copper Mine Reopening

A contract calling for the production of 5,500,000 pounds of copper from a deposit known as the Old Reliable Mine in the Bunker Hill District of Pinal County, Arizona, has been signed by the Defense Materials Procurement Agency and the Copper Creek Consolidated Mining Company, of Tucson.

★ ★ ★

The copper will be extracted by caving the ore underground and leaching it with water and sulphuric acid without removing the ore from the mine. DMPA officials said that while leaching is a common method of recovering copper from oxidized ores in open pit operations, it has seldom been used on underground deposits without first bringing the ore to the surface.

★ ★ ★

There already are two tunnels into the Old Reliable ore body, and some copper has been produced by underground leaching, DMPA officials said. This work plus studies by the Bureau of Mines indicate that the process can be employed on a commercial scale without hauling the ore out of the mine.

★ ★ ★

DMPA will advance the company no money for the project, but will buy all refined copper produced under the contract, up to 5,500,000 pounds, at a price of 29 cents a pound.

★ ★ ★

At its own expense, estimated at $150,000, the company will prepare the ore body for leaching and will construct a copper precipitating plant to recover the copper from the leach water. Production of copper precipitates will get under way in six months, and the company will arrange with a refinery for converting the precipitates to high-grade metal. Production under the contract is to be completed by June 30, 1956.

More Aluminum This Year

More than 90,000,000 pounds of primary aluminum will be made

available to independent fabricators by the three present producers during the third quarter of 1953. This is over and above purchases for the National Stockpile and set-asides for the Atomic Energy Commission and the Department of Defense.

★ ★ ★

As a result of the Government-industry expansion and speedup program, total production of primary aluminum during the third quarter will be over 650,000,000 pounds, of which approximately 220,000,000 pounds will come from new facilities.

★ ★ ★

Construction under the first and second rounds of the aluminum expansion program is about 75 per cent completed. By the time all plants are finished total production capacity will be well over 3 billion pounds of primary aluminum a year.

★ ★ ★

In addition, the Government, is seeking to interest independent producers in a third round of aluminum expansion, and GSA has signed one such contract with the Harvey Machine Company, of Torrance, Calif. Plants to be built under this contract are scheduled for completion by May 1, 1955.

★ ★ ★

The General Services Administration has supply contracts with all of the three present producers —Aluminum Company of America, Reynolds Metals Company and Kaiser Aluminum & Chemical Corporation. With the termination of the Controlled Materials Plan on June 30 a provision of these contracts relating to independent fabricators comes into force.

★ ★ ★

Under this provision, the producers have agreed to make two-thirds of all aluminum produced by the new facilities, less the amounts charged to this total for Government requirements, available for purchase by non-integrated users during the first five years of operation. For the ensuing fifteen years, they have agreed to offer 25 per cent of their

New Data Available on . . .

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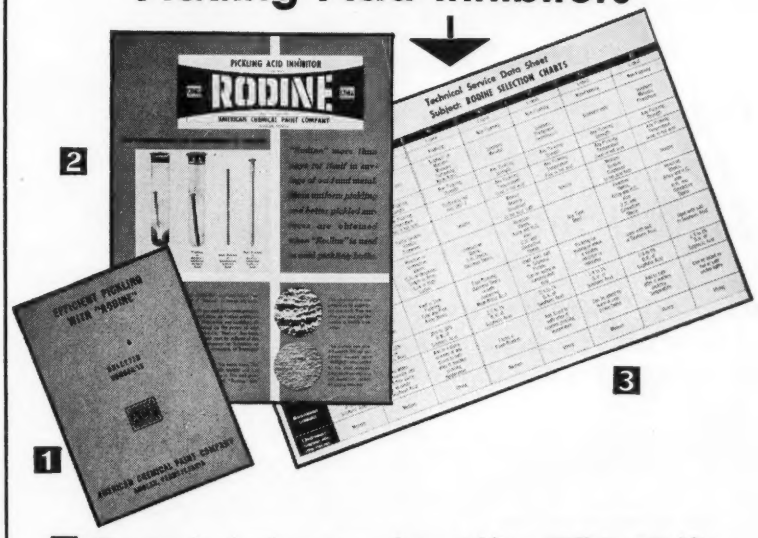
Pickling Acid Inhibitors



1 The standard reference work on pickling, "Efficient Pickling With RODINE" — Bulletin Number 13 — is now available in a new, revised edition.

2 This new 4-page general descriptive folder presents essential information on "Rodine" pickling acid inhibitors.

3 The recently revised "RODINE SELECTION CHART" gives characteristics of and uses for typical "Rodines" used with sulfuric and muriatic acids. Technical Service Data Sheet No. 13-1-1-4.

Use coupon below for free copies of the literature described above.

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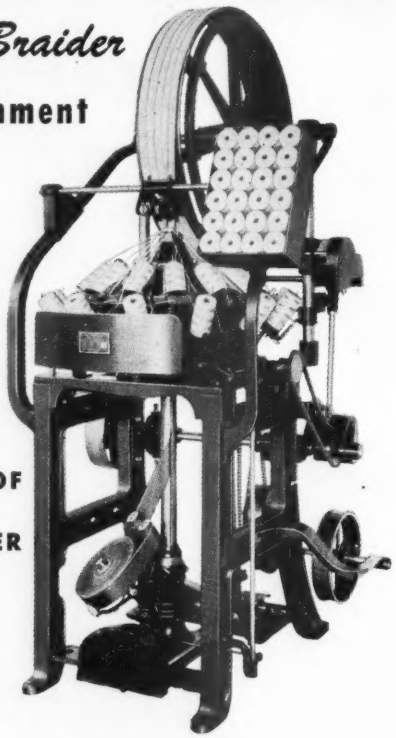
24 Carrier Cable Braider

With Taping Attachment

Applies Tape and Braid to Conductor Simultaneously



HAS ALL THE FEATURES OF WARDWELL STANDARD 24 CARRIER CABLE BRAIDER

- Taping head has means for adjusting the tension applied to the tape, thereby assuring a uniform lay.

  A mechanical stop motion which operates upon breakage or exhaustion of the supply, stops both the taping head and braider head at the same time. This eliminates the possibility of braiding over the conductor when the tape is not being applied.

  Change gears for altering the lay of the tape are conveniently located at front of the machine.

  Due to the space required for the taping attachment, this machine can be furnished with high stand only.
- Production 54" to 259" per minute depending upon the texture of the product.
- Standard set of twelve change gears furnished with each machine.
- Machine can be adapted to produce one-and-one braid by changing thread deflectors.
- Carrier speed 75 R.P.M. for cables from ¾" diameter to maximum of 1⅛" diameter or 500,000 circular mils; production 900 picks or plaits per minute.
- Carrier speed 100 R.P.M. for cables ¾" diameter and smaller, 1,200 picks or plaits per minute.
- Equipped with "Maxitorq" clutch; 12" driving pulley, 3" driving belt.
- Speed of braider countershaft 345 R.P.M. for carrier speed of 75 R.P.M. or 460 R.P.M. for carrier speed of 100 R.P.M.
- Ratio of braider countershaft speed to carrier speed 4.6 to 1.
- Capstan 36" diameter, 6" face.
- Beater opening 1¾" diameter.
- Supply yarn packages Universal wound, 2 11/16" diameter, 5" traverse on tubes 5¼" long, ⅝" hole, four point wind.
- Counter for measuring product in feet or yards furnished upon request.

TAPING ATTACHMENT DATA:

- Maximum number of turns of taping head 100 R.P.M. — minimum 16 R.P.M.
- Maximum diameter of supply package 12".
- Maximum width of tape 3".
- Minimum width of tape ¾".
- Size of hole in tape package 3".
- Head is equipped to run either clockwise or counter-clockwise.
- Power required dependent upon conditions. Estimate furnished upon request.
- Supply and windup stands are not furnished.
- Weight approximately 1850 lbs.
- Weight crated for domestic shipment approximately 2000 lbs.
- Weight boxed for export shipment approximately 2500 lbs. or 1134 kilograms.

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BRAIDING MACHINE CO.
CENTRAL FALLS, RHODE ISLAND, U.S.A.

expanded production to the non-integrateds.

★ ★ ★

Actually, the 90,000,000 and some pounds of primary aluminum (pig, ingot and billets) to be sold by the three producers to non-integrated users during the third quarter is greater by some 18,000,000 pounds than the amount they are required to sell to such users under the two-thirds rule.

★ ★ ★

The 18,000,000 pounds to be sold to non-integrated users over the minimum required by the contracts brings the total for the quarter to approximately the same amount of primary aluminum available to non-integrated fabricators during the present quarter.

Book Review

A. Pomp, "Stahldraht" (Steel Wire), second edition, 335 text pages 6 in. x 9 in. 368 illustrations, 22 tables, published 1952 by Verlag Stahleisen, Dusseldorf, Germany. 38 German Marks. The book is published in German only.

★ ★ ★

Approximately 12 years have elapsed since the publication of the first edition of this well known book. Since then, many improvements have been made in the production of steel wire. The author has skillfully woven them into the framework of the book.

★ ★ ★

"Stahldraht" starts with the wire and rod and discusses the effects of imperfections in the rod upon the quality of the finished wire. It describes and illustrates all stages of wiremaking and ends up with methods of testing the finished product. The effect of each step on the properties of the end-product is discussed. Wire drawing, annealing and patenting take up more than half of the book, but many other steps, such as pickling, hardening, straightening, polishing, and coating with zinc or with tin are treated. Such extraneous subjects as disposal of pickling waste are included.

★ ★ ★

The manufacture of wire goods (springs, fences, sieves, nails, barbed wire, coat hangers, etc.) is not covered.

The Pacific Coast Regional Meeting

The Regional Meeting of The Wire Association for the Pacific Coast area this year was held on Friday, June 12th at the Sir Francis Drake Hotel in San Francisco, California.

★ ★ ★

Joseph N. Kemple, Manager of Wire Rope and Electrical Sales, Columbia-Geneva Steel Division, United States Steel Corporation, San Francisco, served as Chairman of the Program Committee. He was ably assisted by **Earl R. Potter,** President and General Manager of Industrial Wire Products Corp., Los Angeles, and **E. N. Coffin,** Technical Field Representative, Columbia-Geneva Steel Div., United States Steel Corp., Los Angeles, Program Committee members. The registration desk opened at 8:30 A.M., with Mrs. R. S. Spengel, Assistant Secretary of the Association in charge. 101 persons registered for the meeting. Busses left the hotel at 11:30 A.M. for the tour of Columbia-Geneva's Wire Rope and Wire Mills in Pittsburg. The 75 persons who took the tour were served luncheon at the plant cafeteria with the compliments of the company. Following the luncheon, the visitors were escorted through the two extensive mills on what proved to be an interesting and profitable plant inspection trip. The mills were equipped with the most modern machinery and the company's arrangements for handling the tour were excellent. All those taking the trip were back at the hotel by 5:30 P.M.

★ ★ ★

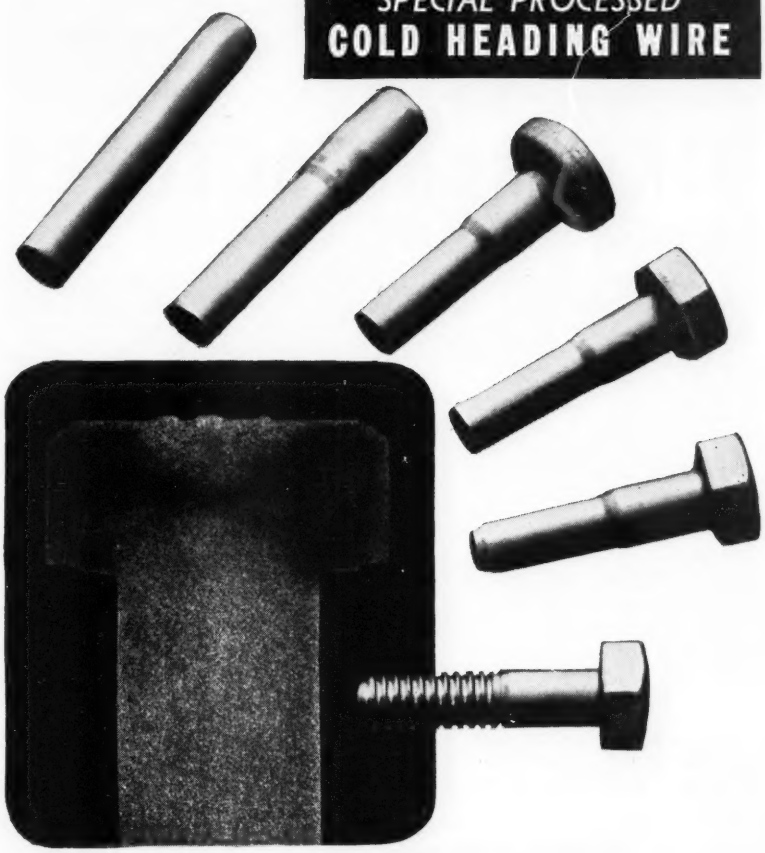
The next "order of business" was the cocktail hour, running from 6 to 7 P.M. for which the R. H. Miller Company, represented by Jeff Crum, provided both music and entertainment.

★ ★ ★

An excellent dinner was served at 7 P.M. attended by 94 people. The technical sessions followed the dinner with Joseph N. Kemple presiding. Two fine papers were pre-

UNIFORMITY . . . from start to finish with KEYSTONE

"SPECIAL PROCESSED" COLD HEADING WIRE



When you use Keystone "Special Processed" Cold Heading Wire, you get uniform response every step of the way through forming, trimming, threading and final heat treatment.

Uniform, strength-giving grain flow characteristics are clearly indicated in the above macrograph of a high-strength cap screw made from Keystone "Special Processed" C1035 Cold Heading Wire. The long, continuous fibres tell the "inside story" of efficient cold heading which results in longer die life, lower production costs and finished products of the highest quality.

INDUSTRIAL WIRE SPECIALISTS

Keystone Steel & Wire Company

PEORIA 7, ILLINOIS

An Open Letter to WIRE MANUFACTURERS

Gentlemen:

Whenever you sell non-metallic sheathed cable, armored cable, or building wire to an electrical contractor, the first thing he looks for is the Underwriters' label. That label tells him that the electrical, moisture-resistant, flame-proofing, and other similarly important requirements have been met. But when the contractor actually begins to install the wire, he is then more concerned with its workability during installation:

Is it sticky in coils or on reels and spools?
Does the finish flake off when the wire is bent or pulled through joists?
Does it mark up walls?
Does it make workmen's hands unduly dirty?
And above all--does it cost the contractor overtime?

The Underwriters' label can't tell him these things; he finds them out by experience. And if experience provides the wrong answers, then your wire --as good a product as it is in itself--gets a bad name. Avoid such complications by making these checks:

Are your present saturants and finishes the most suitable materials for your products and methods of application?
Are you misapplying a saturant? ...using one designed for cotton on glass braid, for instance?
Are you getting all that you are paying for?

If you are not obtaining satisfactory performance from your present saturants and finishes, please write to us. We maintain a highly-trained technical staff which devotes its time to perfecting paints, varnishes, and saturants to meet particular requirements. At no obligation, we will be happy to run a series of tests and then make specific and impartial recommendations as to the materials and methods best suited to your own situation.

Cordially,

E M Paschall

President

EMP:GC

Solar Compounds Corporation
Solar Varnish Corporation
The Originator of Wire Color Solutions
1213 WEST BLANCKE STREET • LINDEN, N. J.

sented. The first was "Wire Rope Origin and Development," given by R. F. Hendrick, Purchasing Agent for the E. H. Edwards Company. The second was a talk entitled "Potential Markets for Western Wire Fabricators," delivered by R. E. Oliver, Manager of Commercial Research for Columbia-Geneva Steel. Both papers were well received.

★ ★ ★

At the close of the meeting, guests were invited to an "open-house" party in the Empire Room through the courtesy of the R. H. Miller Company of Homer, New York.

★ ★ ★

The meeting in general, was considered to be successful and well planned and handled, with a noticeable improvement in the number of production men and mill executives who were in attendance.

★ ★ ★

To Messrs. Kemple, Potter and Coffin, the officers and directors of The Wire Association are deeply indebted for their splendid work in formulating the plans for and in conducting what, if not the largest, was considered possibly the finest Regional Meeting thus far held on the Pacific Coast.

ABSTRACTS

THE MANUFACTURE OF RADIO VALVES.

Mullard Ltd. Wire Ind 1953 Vol 20 (231) pp 328-329 (Mar)

Mullard film on manufacture of radio valves and television picture tubes shows making of fine tungsten and molybdenum wire for valve filaments and grids. Some of this is less than 8 micron in dia. After sintering, swaging and reduction to 1/50 in. in tungsten carbide dies, diamond dies are used. After 200 to 300 drawings and treatments original tungsten and molybdenum bars are reduced to 20 miles of fine wire.

★ ★ ★

DIE MACHINERY.

Anon. Wire Ind 1953 Vol 20 (231) p 309 (Mar)

Illustr 3 Zetto models ie single spindle grinding and polishing machine, 10-spindle grinding machine, and single spindle polishing machine for carbide dies. Rudkin & Riley 2006/3 hand-polishing machine has ½ hp motor starter and isolater on common base for wiring to electric supply. Quick-release hand rest aids operator, particularly when blending radii. 4 in. self centring chuck

may be replaced by chucks up to 8 in. Grease nipples in headstock for lubrication. Double-grooved pulley provides polishing speeds of 2,400 or 3,150 rpm. Heavy ripping machine for round or shaped dies by G. Crossley Ltd, Cleckheaton. Brontalloy diemaster by Bartin Ltd, Birmingham, machines hardmetal rapidly and accurately. 6 illustr.

★ ★ ★

ZUR FRUEHGESCHICHTE DER DRAHTHERSTELLUNG. THE EARLY HISTORY OF WIRE MAKING.

F. M. Feldhaus. Draht 1953 Vol 4 (2) pp 63-64 (Feb) (In German)

Brief account of wire drawing and plating in Nuremberg around 1600 AD, and controversy regarding these. 3 illustr.

★ ★ ★

INSTRUMENT FOR CHECKING WIRE-DRAWING DIES.

Am Opt Co. Machinery (NY) 1953 Vol 59 (7) p 228 (Mar)

'AO Elder' die-angle scope for measuring entrance angles of dies down to 0.005 in. Multiple angles and poor polish immediately detected; no skill required. 1 illustr.

★ ★ ★

PROBLEMS IN CONNECTION WITH THE DRAWING OF STEEL WIRE.

C. O. von Hofsten. Varm Bergsmann 1951 pp 32-53; abstr Iron & Steel Inst Journ 1953 Vol 173 (3) p 304 (Mar) (Original in Swedish)

★ ★ ★

LUBRICANT CARRIERS FOR THE DRAWING OF LOW AND HIGH CARBON STEEL WIRES.

W. Lueg & K. H. Treptow. Stahl u Eisen 1952, vol 72, 1207-1212

The various lubricant carriers are classified and their essential characteristics are specified. The production of lime and the effect of composition on its properties as a carrier are fully discussed. The advantages of borax over lime and of the newly developed alkaline phosphates and silicate materials are indicated. The use of films of colloidal graphite as lubricant carrier is briefly discussed: results indicate that the use of graphite will be restricted to special case such as the drawing of tungsten wires.

★ ★ ★

STRIP AND WIRE DRAWING. A SIMPLE ACCOUNT OF MODERN THEORY.

J. G. Wistreich, B.I.S.R.A. Iron and Steel. Vol. 25, No. 10, p. 391. 1952

A simple non-mathematical exposition of modern drawing theory is given. Some important features of modern plasticity theory are outlined and are followed by a description of the theory of drawing wide strip developed by Hill and Green. The theory of drawing round wire does not yet exist but its essential features are predicted from the strip drawing theory and from recent wire drawing and extrusion experiments.

★ ★ ★

High Quality High Carbon Wires
Some people believe that with machines that compute up to fifteen numbers, lay 2000 bricks in a day, shell fifteen tons of peas, man is a fool ever to get out of bed.
Here at Johnson, the advance of wire making machinery has not made our specialists less interested, but has impelled them to find more new ways for making our product better, which in turn makes your product better.
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A SUBSIDIARY OF PITTSBURGH STEEL COMPANY

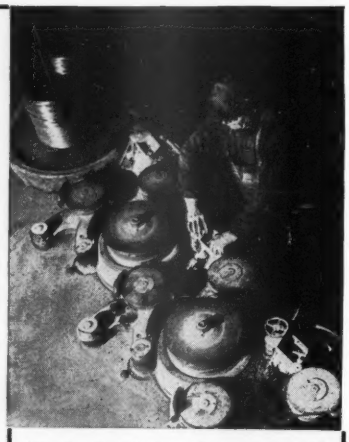
AMERICAN CHEMICAL PAINT COMPANY
AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet
Subject: IMPROVED DRAWING AND COLD FORMING WITH GRANODRAW

INTRODUCTION:

When steel is phosphate coated with "Granodraw" prior to working it, drawing, extrusion, and other cold forming operations are greatly improved. In fact, the protective phosphate coating makes the cold extrusion of steel possible.

Getting cold steel to flow depends on the unique properties of this coating. Its non-metallic phosphate crystals are physically and chemically adapted to acquire a strongly adsorbed lubricant. The combination of adherent phosphate coating and adsorbed lubricating film possesses a low coefficient of friction while maintaining its integrity under extremely high deforming pressures.



The drawing of wire and many other cold forming operations — including the cold extrusion of steel — are greatly facilitated by the application of a "Granodraw" phosphate coating and a suitable lubricant prior to working.

"GRANODRAW" DATA

"Granodraw" zinc phosphate coating chemical is applied to pickled surfaces in an immersion or spray process. When used with a suitable lubricant, the coating reduces friction under conditions of low, medium, or high deforming forces encountered in such typical operations as: cold extrusion of steel; cold shaping; deep drawing (tubs, cartridge cases, shells, etc.); stamping; drawing of wire and tubing; ironing; necking; nosing; and upsetting.

ADVANTAGES OF PHOSPHATE COATING WITH "GRANODRAW" PRIOR TO COLD FORMING STEEL

The following are among the advantages indicated for phosphate coating with "Granodraw" prior to cold forming steel:

Drawing of wire, bars, tubing, etc. — Improved lubrication; improved surface; less scratching; reduced pull; greater percent reduction per pass; reduced die wear; longer die life; lower die maintenance and cost; reduction in corrosion.

Drawing of stampings, shells, shell cases, etc. — Improved lubrication; reduced breakage; reduction in scrap; deeper draws; less scratching; elimination of some annealing; less wear on dies.

Cold Extrusion — Improved lubrication; increased strength of parts; improved surface; reduction in load on press; greater dimensional accuracy; more uniform wall thickness; longer extrusions; elimination of some annealing; less corrosion.

CHEMICALS ACP PROCESSES

WRITE FOR FURTHER INFORMATION ON "GRANODRAW" AND ON YOUR OWN METAL PROTECTION PROBLEMS.

CHEMICALS ACP PROCESSES

AUTOMATISCHE DIAMANT- UND HARTMETALL - ZIEHSTEINBOHR- UND -POLIERMASCHINE. AUTOMATIC DRILLING AND POLISHING MACHINE FOR DIAMOND AND SINTERED CARBIDE DIES.

Siegfried Eder, Vienna-Oberlaa. Technik & Betrieb 1953 Vol 5 (1) p 23 (In German)

New machine for drilling carbide (0.15 to 4.00 mm dia) or diamond (0.05 to 2.00 mm dia) wire drawing dies. During die polishing by wire, 5 separate movements executed simultaneously: (a) reciprocating movement of polishing wire (80 oscillations per min); (b) rotation of die stone; (c) continuous slow supply of fresh polishing wire by movement of tool holder; (d) adjustable number of oscillations of 500, 1,000, 3,000, 4,000 strokes per min; (e) automatic oscillation of die stone adjustable within range of 8 to 28 deg. Carbide die drilled to 0.15 mm within 60 min. Similar results on diamond dies. Machine claimed to have about 5 x efficiency of usual type. 1 illustr.

★ ★ ★

PRUEFEN UND UEBERWACHEN DER ARBEITSFLAECHEN VON HOHLWERKZEUGEN, BESONDERS VON REDUZIERGESENKEN FUER DIE SCHRAUBENHERSTELLUNG UND VON HARTMETALL-ZIEHHOLEN. TESTING AND CONTROLLING THE WORK SURFACES OF REDUCING DIES FOR SCREW PRODUCTION AND HARDMETAL DIES.

W. Lueg. Stahl & Eisen 1953 Vol 73 (10) pp 621-629 (May 7) (In German)

General survey and description of new method in which polished cone is introduced into hole and reflections from wall of hole on cone itself are observed microscopically. Investigations on sintered carbide and diamond dies. In this method, mirror-finished cone of 90 deg angle usually used, giving reflections in ratio 1:1. At first silver steel, hardened and polished, was used; subsequently replaced by sintered carbide G1 which showed better accuracy in shape, particularly of cone point. Many illustr of dies with significant blemishes. J. Hinnueber considers these a favourable supplement to new measuring instruments developed by W. Lueg. He considers that this method will help in improvement of drawing and press tools, particularly in increasing their life and economy. 53 illustr, 18 ref.

★ ★ ★

DIE GRINDING AND POLISHING MACHINES.

US Dept Commerce, Office Techn Services; US Mutual Security Agency, Prod & Techn Asst Div. Question & Answer Service IR 8478.

Inquiry re technical data and prospectuses from manufacturers of die grinding and polishing machines. Following recommended: Hartford Special Machinery Co, Hartford 12, Conn (flexible belt die polishing machine); Skilsaw Inc, 5033 Elston Avenue, Chicago 30, Ill (portable and bench grinders in grinder with max speed of 36,000 rpm, pneumatic grinder); Mall Tool Co, 7740 S Chicago Avenue, Chicago 19, Ill (pneumatic die grinder, min speed 30,000 rpm, not more than 0.0015 in. runout of collet heavy duty grinder with noise silencer); Dumore Co, 1300 17th St, Racine Wis (flexible shaft tools).

Outstanding Personalities of the Wire Industry

Firth Sterling Appointments

Firth Sterling Inc. has announced the establishment of its new Chicago District Office and Warehouse, at 3415 North Avenue, Melrose Park, Illinois, in the new northwest manufacturing district. The new warehouse provides increased and improved facilities for stocking Standard Firthite Carbide Products, and High Speed Tool and Die Steels, which will result in prompt and efficient service and delivery to customers. The former warehouse was located at 710 West Lake Street, Chicago.

★ ★ ★

R. O. Valoon, with Firth Sterling for nineteen years, has been appointed District Manager of the Chicago District. He replaces E. A. Carpenter who has resigned to establish his own business.

Mr. Valoon came with Firth Sterling in 1934, and spent twelve years in Production and Operation at the McKeesport, Pa. Plant. He then spent two years as a Service Engineer in the Carbide Division. In 1948 he went to Detroit as a salesman, and was later transferred to Buffalo where he has remained until his recent appointment.

★ ★ ★

The company has also announced the appointment of **Lester N. Shannon, Jr.** as District Manager of the Company's Southern District. Mr. Shannon replaces Charles E. Hughes, resigned.

★ ★ ★

Mr. Shannon is a graduate engineer from Alabama Polytechnic Institute, Auburn, Alabama. He served as a Lieutenant in the Navy during World War II, after which he spent three years with Linde Air Products in a Sales Promotion capacity. Mr. Shannon then started his own company, Materials Handling Service Company, before being recalled by the Navy. He has just recently been released after serving one year in Japan.

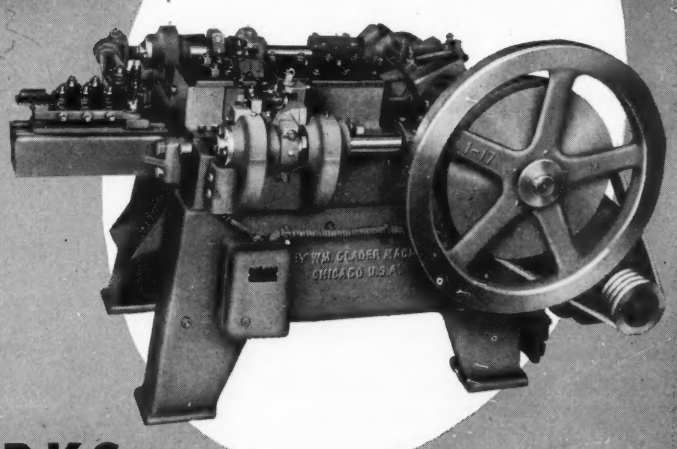
★ ★ ★

Firth Sterling's Southern District Office is located at 2308 Fourth Ave. N., Birmingham, Alabama. The Company is one of the country's leading producers of tool and die steels and sintered carbides.

Controllers for Two Divisions Appointed by C. F. & I.

Appointment of **C. M. Ahearn** as Divisional Controller of the **Eastern Division** of **The Colorado Fuel and Iron Corporation** was recently announced. Mr. Ahearn will assume supervision of the controllership functions of all Eastern Division subsidiaries of CF&I, in-

high efficiency — low cost
with GLADER wire nail machines



Eliminate costly down-time in the Nail Mill by replacing obsolete machines with new GLADER NAIL MACHINES . . . For tops in efficiency and economical operation use GLADERS.

WM. GLADER MACHINE WORKS

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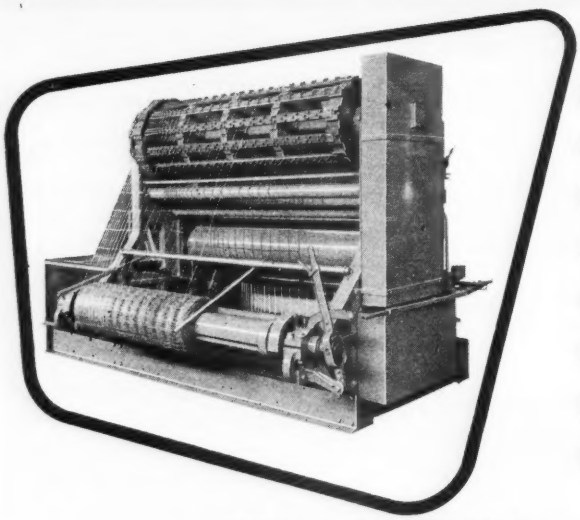
Interlocking FENCE LOOMS

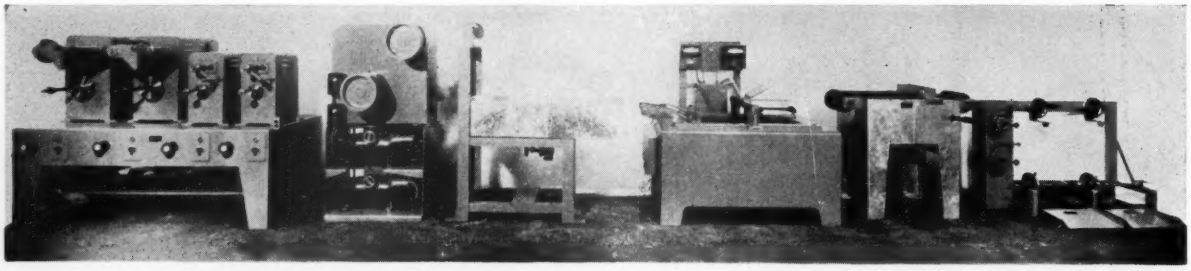


- Fastest — Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated — Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box M8, Morton, Ill.

Specialists In Fence Looms



Outfit #1060

FOUR LINE TINNING OUTFIT, ESPECIALLY USEFUL TO MANUFACTURERS WITH A VARIETY OF WIRE SIZES TO TIN, BUT WITH SMALL POUNDAGE.

Component units include:

A let-off for 2 small spools for fine wires and 2 large spools for heavy wires.

An acid tank.

A tinning tank, electric heated, with automatic temperature controls, immersion arms and wipers.

A water bath.

A capstan unit and a take-up, arranged for 2 large spools for large size wires and 2 small spools for small wires, each spool spindle driven by a torque motor.

EST. 1855 AIMco INC. 1915

"American" AIM INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

FAIRHILL AND HUNTINGDON STREETS

PHILADELPHIA 33 PENNSYLVANIA U.S.A.

cluding the recently acquired John A. Roebling's Sons Corporation. His headquarters will be in the executive offices of CF&I in New York City.

★ ★ ★

At the same time, announcement of the appointment of **W. R. Dunn** as Divisional Controller of the **Western Division** of the company was made. Mr. Dunn's headquarters will be at the Pueblo, Colorado offices of CF&I, where all central records of the corporation will continue to be maintained, Mr. Franz said. Mr. Dunn will supervise controllership of CF&I and subsidiaries in the western half of the United States, as well as maintaining the central records.

Sheet and Tube Promotions

Three changes in sales and order departments have been announced by **The Youngstown Sheet and Tube Company.**

★ ★ ★

Ralph W. Mowry, manager of the order department in general offices here for nearly eight years, has been appointed assistant manager of flat rolled sales. He succeeds **L. E. Arnold** who advanced to manager of flat rolled sales when **John M. Tuthill,** former manager, was transferred to the company's offices in Chicago as assistant general manager of sales. Mr. Tuthill succeeded Arthur M. Long, who died last year.

★ ★ ★

Dave Lewis, assistant manager of the order department in Youngstown, advances to manager. **George L. Williams,** assistant manager of the order department in the company's Chicago offices, has been advanced to manager.

Machinery Concern Acquired by Worcester Company

Wire Insulating Machinery, Inc., of Manchester, Connecticut, was recently purchased by **Machinery Electrification, Inc.,** 98 Union Street, Worcester 8, Massachusetts. All of its facilities have been moved to Worcester, where it is now operating as a subsidiary of Machinery Electrification, Inc.

★ ★ ★

Harold H. Duff continues with Wire Insulating Machinery, Inc. as Manager. **Frank Bonneau** has been added to the organization as Chief Engineer, and the full engineering and development facilities of Machinery Electrification, Inc. have been made available to its subsidiary.

★ ★ ★

The parent company develops and manufactures electrical control equipment and specializes in the application of power and control to machinery.

★ ★ ★

The Wire Insulating Machinery, Inc., design and manufacture standard and special wire processing equipment, among which is an electronically controlled, fully automatic continuous coiler and respooler.

(ILLUSTRATED)
42" x 20" x 21"—(4000# cap.)

HEAVY DUTY
BREAK-DOWN REELS

1000#
2000#
4000#
} capacities

Rugged Design including patented DURA-CURL rim, and many other features necessary to provide the *Strength* and *Durability* needed for continued successful performance.

Also complete line of sizes of Modern High Speed Wire Drawing NO-CREV Spools and Reels for both fine and intermediate size wire.

Mossberg PRESSED STEEL Corporation

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#103

Appointed Philips Representative in Utah

John Jeppson, formerly assistant secretary and works manager, has been appointed as local representative for the Research and Control Instruments Division, **North American Philips Company, Inc.,** 750 South Fulton Avenue, Mount Vernon, New York.

★ ★ ★

Mr. Batchelor will handle all of the NORELCO analysis instruments including the Philips electron microscope, the new 90° Geiger-counter X-Ray Spectrometer along with the standard large unit of the same type, the X-Ray Spectrograph (fluorescence analysis), quartz crystal analysis equipment, and the complete line of film type x-ray diffraction apparatus together with powder cameras and accessories.

C. F. & I. Promotes Three Engineers

Three men have been appointed to new posts by **Colorado Fuel and Iron Corporation** in its Minnequa Works at Pueblo, Colo. These are: **Frank F. Argust,** who has been made superintendent of industrial engineering; **Morton E. Weichsel,** who becomes manager of industrial engineering; and **Dean B. Valentine,** who is now assistant superintendent of industrial engineering. All appointments became effective in May, 1953.

Coulter Named Scovill Comptroller

Ivan L. Coulter was recently appointed comptroller and assistant treasurer of **Scovill Manufacturing Company** by the Board of Directors. Mr. Coulter, who had been assistant comptroller, succeeds the late William F. Burke.

★ ★ ★

Also appointed were **Edward H. Bengston** and **George H. Wadsworth** as assistant comptrollers, and **Walter L. Wood** as assistant secretary.

Clayton Clark

It is with great regret and a sincere sense of loss that we announce the sudden death of **Mr. Clayton Clark,** of the Davis Press, Inc., Worcester, Mass., on Tuesday, July 7th. Mr. Clark passed away shortly after his return from vacation.

★ ★ ★

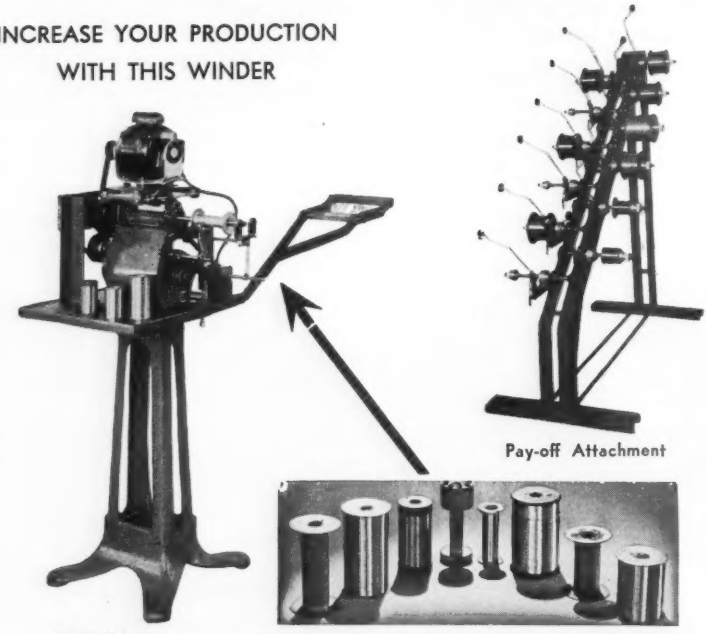
He will be greatly missed, not only in the Davis Press family, but throughout the field.

★ ★ ★

Sincere sympathy is offered to his many friends and family.

STANDARD UNI-DRIVE WIRE WINDER.

INCREASE YOUR PRODUCTION
WITH THIS WINDER



Pay-off Attachment

Wire Winder

Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAYOFF

Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

The new Uni-Drive Winder with Payoff Attachment is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel—no over or under-winding. Automatic Stop-Motion controls each strand. Compensating attachment produces perfectly controlled tension. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors up to ¾" diameter.
Payoff can be equipped with Carboloy Guide Inserts at additional cost.

STANDARD MILL SUPPLY COMPANY
PAWTUCKET, R.I., 1064-1080 Main St.
PAwtucket 3-1534 — 3-1535 — 3-1536

THE 1953 WIRE & WIRE PRODUCTS
BUYERS' GUIDE
Now on sale — Order your copy to-day. Price: $5.00; to subscribers $3.00; no extra charge to members of Wire Association.
WIRE AND WIRE PRODUCTS
453 Main Street Stamford, Conn.

A Review of Recent Wire Patents

No. 2,640,510, WIRE-FORMING MACHINE, patented June 2, 1953 by Harry M. Young, Webster Groves, Mo.

The machine is adapted to produce wire fence post clips and the like.

★ ★ ★

No. 2,640,521, SPLIT HEAD LOCKING SCREW, patented June 2, 1953 by Stephen V. Zavoico, Lake Forest, Ill., assignor to The Eagle Lock Company, Terryville, Conn., a corporation of Connecticut.

A vibration resistant screw is disclosed and one which does not become loose until unscrewed a considerable portion of a revolution.

★ ★ ★

No. 2,640,663, DEVICE FOR CONTROLLING THE TENSION OF A LONGITUDINALLY MOVING WIRE, patented June 2, 1953 by George H. Leland, Dayton, Ohio, assignor to G. H. Leland, Inc., Dayton, Ohio, a corporation of Ohio.

This apparatus comprises a pulley about which the wire passes and which is rotated by the wire, a movable device frictionally engaging the rotating pulley and adjusted to normally offer a predetermined resistance to the rotation of the pulley by the wire, and controlled solely by a change in the resistance to adjust the movable device to re-establish this predetermined resistance.

★ ★ ★

No. 2,640,788, COATING CONTROL SYSTEM, patented June 2, 1953 by John F. Rockett, Jr., Medford, Mass., assignor to Columbia Broadcasting System, Inc., Salem, Mass., a corporation of New York.

In this apparatus there are a first reel holding uncoated wire, a coating bath containing coating material and a minute quantity of radioactive tracer material having a short half-life, a radiation detecting device, a wind-up reel to draw the uncoated wire from the first reel and consecutively through coating bath and past the detecting device, a motor for driving the wind-up reel, a standard source of radiation, and means responsive to the difference between radiation from the standard source and that detected by the radiation detecting device for varying the speed of the motor.

★ ★ ★

No. 2,640,789, METHOD OF PRODUCING REINFORCED WIRE NETTING, patented June 2, 1953 by Joseph Hausner, Jamaica, N. Y.

Steps in the method comprise immersing a wire screen of a metal of higher electromotive force and higher melting point than copper in a concentrated aqueous solution of crystalline copper sulphate and sulphuric acid to produce a metal coating upon the screen, and heating the coated screen in a non-oxidizing atmosphere at a temperature sufficient to fuse the coating upon the wire screen and to braze the wires at their intersections.

No. 2,641,367, RECEPTACLE HOLDING AND SUPPORTING APPARATUS, patented June 9, 1953 by Harold F. Wetzel and Albert W. Wetzel.

This device is constructed solely of wire strands and includes hooks and a clip portion.

★ ★ ★

No. 2,641,470, DEVICE FOR HOLDING COILS OF STRAPPING WITH MEANS FOR DELIVERING LENGTHS THEREFROM, patented June 9, 1953 by Anton J. Friedl, Chicago, Ill., assignor to United States Steel Corporation, a corporation of New Jersey.

Steel strappings as employed for securing loads in place in freight cars are held in roll form until required for use and may be fed from the device.

★ ★ ★

No. 2,641,559, METHOD OF CLEANING AND DESCALING FERROUS ARTICLES AND A BATH THEREFOR, patented June 9, 1953 by Matti H. Pakkala and Freeman J. Phillips, Pittsburgh, Pa., assignors to United States Steel Corporation, a corporation of New Jersey.

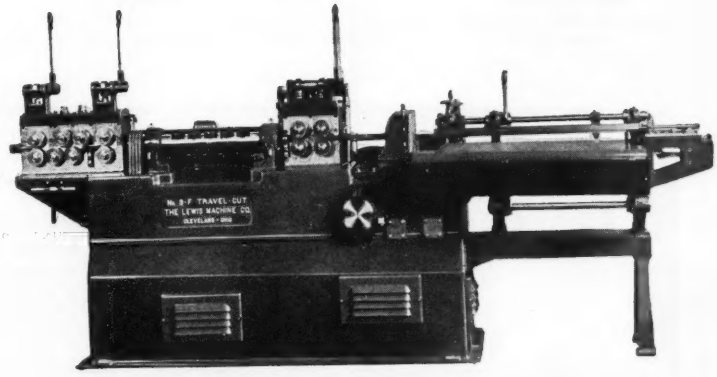
The bath consists of a fused mixture

(*Please turn to page* 842)

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS TRAVEL-CUT



22 Models to handle from .012" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL-CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL CUT. Full details on request.

Exclusive Representatives

EAST: Penn Machinery Co., 117 North Third Street, Philadelphia 6, Penn.

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CENTRAL: Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio.

WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California.

CANADIAN: Empire Engineering Co., 11 738 Dundas St., Toronto, Ont., Canada

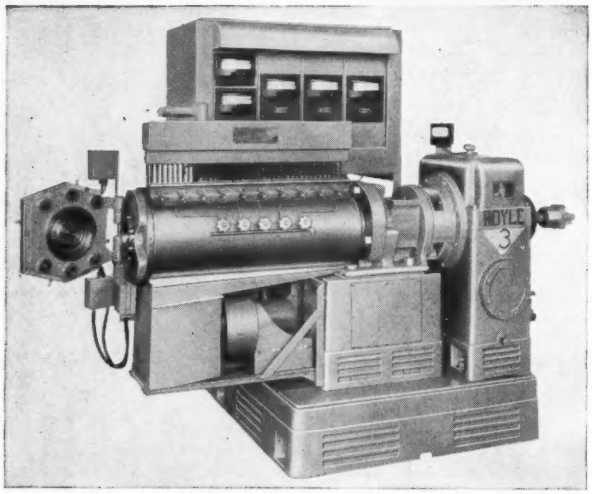
CONTINENTAL EUROPE: Gaston E. Marbaix Ltd., Devonshire House Vicarage Crescent, London S. W. 11, England.

The LEWIS MACHINE Company

3441 E. 76th Street, Cleveland 27, Ohio

Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne

FASTEST HEATING FASTEST COOLING



Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

*Patent Applied For

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ROYLE PATERSON N. J. 1880

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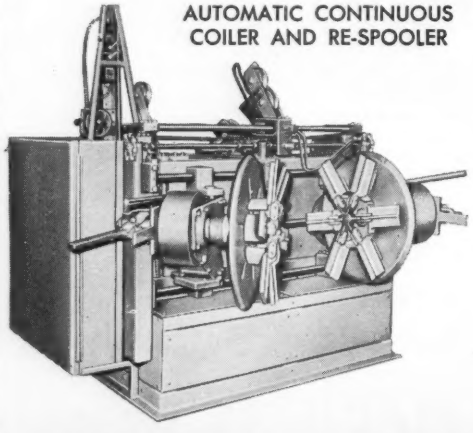
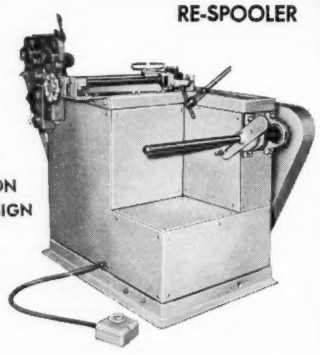
PATERSON 3, NEW JERSEY

DESIGNED FOR PRODUCTION EFFICIENCY

AUTOMATIC CONTINUOUS COILER AND RE-SPOOLER



RE-SPOOLER



- ELECTRIC BRAKE
- VARIABLE SPEED
- CONSTANT FOOTAGE
- PUSH BUTTON CONTROL
- AUTOMATIC ACCELERATION
- RIGHT OR LEFT HAND DESIGN
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- FULLY AUTOMATIC
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- AUTOMATIC CROSSOVER
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- SYNCHRONIZED ELECTRIC TRAVERSE
- AUTO-RESET PREDETERMINED COUNTER
- REMOVABLE SHAFTS FOR RE-SPOOLING
- ADJUSTABLE COLLAPSIBLE COILING HEADS

WIRE INSULATING MACHINERY, INC.

Division of Machinery Electrification, Inc.

98 UNION STREET WORCESTER 8, MASS.

Copper, Copper Alloy Wire and Electric Conductor Men . . . Note the Coming

NON-FERROUS DIVISION'S WATERBURY REGIONAL MEETING

It's Your Meeting—Come to it on FRIDAY, SEPTEMBER 18, 1953, at the Elton Hotel, Waterbury, Conn.

THE PROGRAM

8:30 A.M.—Registration desk opens. One fee of $7.00 covers meeting, busses, cocktails and dinner.

10:30 A.M.—Technical Session:

PAPER—"Continuous Casting of Brass" by Daniel S. Ogden, Sales Manager, Continuous Metalcast Co., Inc., New York, N. Y.

PAPER—"Plastic and Rubber Covered Cable" by R. A. Schatzel, Vice Pres. and Director of Engineering, Rome Cable Corp., Rome, N. Y.

1:30 P.M.—Plant inspection to the Rod and Wire Mills of Scovill Manufacturing Company. Those who were disappointed last year at not being able to visit these up-to-date mills will be given the opportunity in September. Use the special busses—no private cars.

5-6 P.M.—Cocktail Hour.

6:00 P.M.—Dinner. After dinner the gathering will be addressed by John S. Coe, Manager of Products, Chase Brass & Copper Company, Waterbury, Conn. The title of his talk will be "Marketing Conditions." Mr. Coe's long experience with brass mill products well qualifies him to give a talk worthy of your careful consideration.

It is planned to conclude this meeting by 9:00 P.M. to enable those who have motored to Waterbury for the day to return to their homes in good season.

THE PROGRAM COMMITTEE
CHAIRMAN

William L. Wells
Reilly-Whiteman-Walton Co., Conshohocken, Pa.

MEMBERS

James E. Flood
Plastic Wire & Cable Corp.
Jewett City, Conn.

Kenneth D. Roberts
Waterbury Farrel Foundry and Machine Co.
Waterbury, Conn.

Grayson B. Wood, Jr.
Scovill Manufacturing Co.
Waterbury, Conn.

Benjamin McGar
Chase Brass & Copper Co.
Waterbury, Conn.

William Schmallinger
Chase Brass & Copper Co.
Waterbury, Conn.

Willard deCamp Crater
Naugatuck Chemical Div.
United States Rubber Co.
Naugatuck, Conn.

Edward O. Johnson
Plastic Wire & Cable Corp.
Jewett City, Conn.

MAKE YOUR PLANS NOW TO ATTEND—IT WILL BE A FINE MEETING

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

453 MAIN STREET — STAMFORD, CONN.

Get the Most from Your Enameling Dies

(*Continued from page* 787)

can be quickly pinpointed and corrected.

★ ★ ★

Inasmuch as roller die inspection and cleaning processes are time consuming operations, it is recommended that the user make up die rods well in advance of production requirements rather than waiting until the enameling machine is ready to be switched over to the next run. Considerable machine and operator time can be saved on the enamel floor thereby.

Rectangular Wire Dies

The special requirements of coating rectangular wire are met by a special adjustable wiper die of turks head design as illustrated in Figure 6. Here the die is shown mounted with a sample of rectangular wire showing the relation of the die components to the wire.

★ ★ ★

The insulation sizing action of this die is accomplished by four roller pins held in proper relationship to the four sides of square or rectangular wire by four guide

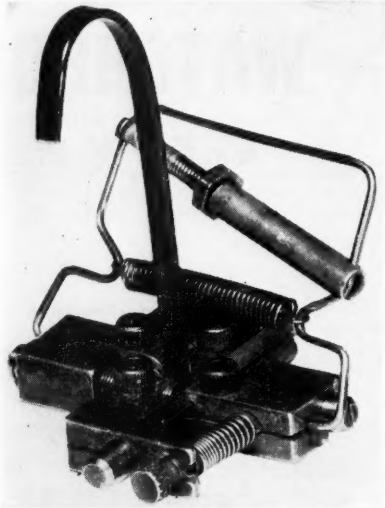


Figure 6. Adjustable wiper die for rectangule wire. (Curved part is a piece of wire inserted for illustration purposes).

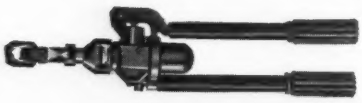
blocks comprising the body of the die. Each guide block has a clamp arm with a setscrew which clamps the operating end of a roller pin and each guide block has a guide hole in which is inserted the free end of the pin clamped in the adjacent guide block. Springs are fastened onto the guide blocks so that the blocks are drawn to the common center of the die, sliding on the free ends of the pins. This spring tension causes the pins to clamp down on the four sides of the wire with sufficient force to spread out the enamel clinging to the wire leaving the applicator tank in a smooth even film of the desired thickness.

★ ★ ★

This die is designed so that it may be separated into two pieces for easy removal from the wire by removing the large spring clip from the assembly. The sliding action of the guide blocks on the free ends of the pins permits the operating edges of the pins, acting under spring tension, to open

The Right Cutting Tools

CAN CUT YOUR COSTS, TOO!



MODEL 200-A

NEW, POWERFUL, HAND OPERATED HYDRAULIC CUTTER

Cuts ½" reinforcing rod and other comparable materials with ease. Simple hand pump action develops 8500 p.s.i. exerting 10 tons cutting force. Blades easily removed for resharpening. Weight —15 lbs. Length—24".

MANCO

SPECIALIZED CUTTING TOOLS

Cut reinforcing rod, chain, bolts, wire rope

NEW IN BOLT CUTTERS!

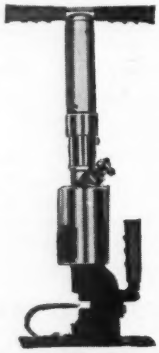
Reversible Jaws Give Double Blade Life

New, exclusive design gives you twice the cutting life from one set of jaws. Handles are *guaranteed against breakage.* Available in 30" size. Capacity, ½" bolts, ⅜" rod. Jaws alone available to fit standard 30" bolt cutters.

MODEL 2 MCC

PORTABLE HYDRAULIC GUILLOTINE

Heavy-duty hydraulic cutter provides 22½ tons cutting force yet weighs only 40 lbs. Cuts ¾" reinforcing rod, 1" log chain. Other similar models to cut wire rope. Easy hand pump action. Also available with a variety of power pump units for high speed production cutting.



MODEL 20-A

See Your Distributor or

Write **MANCO MFG. CO.,** BRADLEY, ILLINOIS

and close with irregularities of the wire. It also permits the one die to handle any size wire within its design range, since, regardless of the spread of the guide blocks, the operating edges form a square or rectangular aperture with equal and parallel sides.

★ ★ ★

The quantity of enamel thus applied to the wire is gauged by the size and spacing of V-shaped grooves cut on the surface of the cylindrical pins. Thinner coats are obtained with pins with no grooves but with only the plain surface of the pin.

★ ★ ★

In general, plain pins are used to coat the thin edges of rectangular wire and the grooved pins are used on the wide flat sides to spread the enamel evenly. The thickness of the coat is regulated by the proper balance of pin groove size, tension on the die springs, wire size and speed and oven temperature.

★ ★ ★

In practice the use of grooved or smooth pins is placed at the discretion of the enamel machine operator who is required to produce an insulation coating on the wire in accordance with manufacturing specifications. Because of the extreme variety of rectangular wire sizes it becomes impractical to try and predict which type and size pin should be used with a particular application. The operator should be required to maintain a continual check on his finished wire dimensions in order to maintain the desired final results.

★ ★ ★

It is most important that the guide blocks be free to slide on the pins to permit the die to expand and contract to follow dimensional variations of the wire being coated. The guide blocks should be kept lubricated during operation so that the die does not freeze or gum up. The die is easily lubricated with a thinner, not injurious to the enamel being handled, applied with an ordinary squirt oil can. The operator should be instructed to lubricate the dies at least once every hour during continued operation.

★ ★ ★

The die pins will wear on the line of contact of the pin with the surface of the wire, particularly on the first, bare wire pass. It becomes the operator's responsibility to watch the pins for wear and to assemble the dies so that worn surfaces are not used. By loosening the clamping setscrew, the pin can be rotated to present a new surface to the wire. By systematic rotation of the pin, it should be possible for the user to obtain maximum die pin life.

★ ★ ★

The operator's task can be helped if he is provided with thinner at the enamel machine for cleaning and storing dies and pins not being used on the enameling machine. Storing the components in thinner solutions will keep the parts from becoming fouled up as might occur if the parts are left lying around loose in the enamel room.

NRM

"JOB-DESIGNED" WIRE COVERING EQUIPMENT . . .

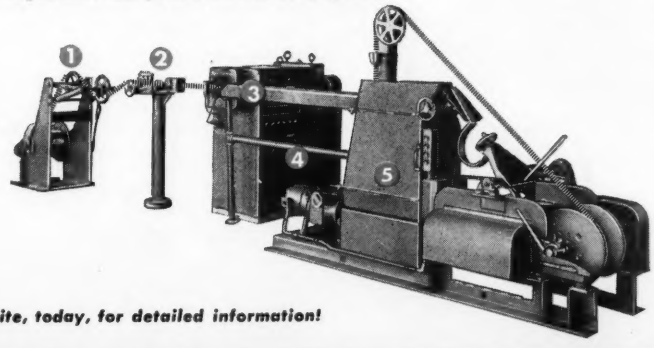
When it comes to covering wire with plastics, you can't beat NRM extruders and their tailormade accessories. For NRM equipment is specifically designed to do an exact job of insulation with any of the wire covering plastics — including Nylon.

Pictured here is the equipment designed to cover wire with vinyls, or polyethylene. With a few simple changes, this same basic machinery can be used with Nylon.

Important features of NRM equipment include rugged electrically heated extruders with built-in "Balanced Heat Control" for exact temperature control; precision-built, alloy steel feed screws with flame hardened flight surfaces designed to eliminate "pulsation"; unique die and front flange assembly for faster die and screen changes and easier "change-overs"; and, supply reels, wire straighteners, wire preheaters, and cooling and take-up units engineered to give a fast, continuous production at close tolerances.

Important, too, are the quality workmanship and years of experience that go into all NRM equipment.

1. Supply Reel Stand
2. Wire Straightener
3. 1½" Electrically Heated Plastics Extruder
4. Cooling Trough
5. Combination Take-Up and Cooling Unit



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2040

NATIONAL RUBBER MACHINERY CO.

General Offices & Engineering Laboratories: Akron 8, Ohio
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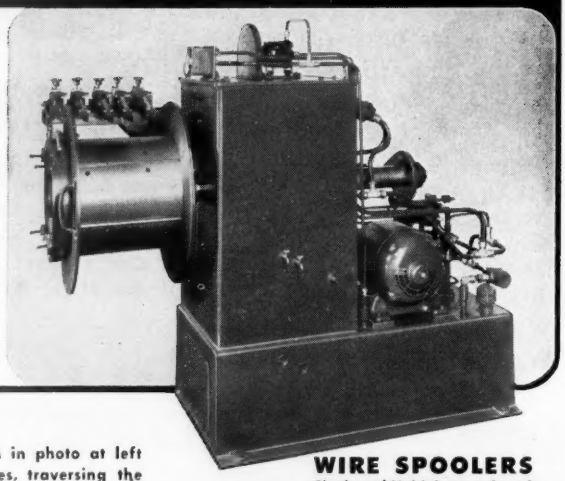
Creative Engineering

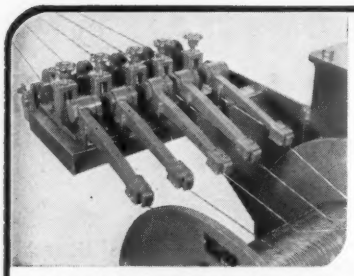
COIL 5 STRANDS IN 1 OPERATION

SECO TRAVERSE REEL SPEEDS UP PRODUCTION

This new SECO Traverse Reel winds five separate coils of flat wire or narrow strip *at the same time.* Coils are oscillated-wound, permitting much longer lengths than conventional ribbon-wound coils. Smooth, powerful hydraulic operation gives coiling speeds as high as desired, accurately controlled from zero to top running speed.



WIRE SPOOLERS
Single and Multiple type. Speeds up to 4,000 feet per minute.



Method of coiling is shown in photo at left The complete block oscillates, traversing the wire into five 3" wide coils. Traverse and tension control are extremely accurate. 1/8" to 1/2" wide flat wire can be wound. Block has 16" inside diameter and 24" outside diameter.

Call or Write for Information and Complete Data — No Obligation

STEEL EQUIPMENT CO. P. O. Box 737, Warrensville Station, Cleveland 22, Ohio

SECO

WAFIOS

WIRE-WORKING MACHINERY

Wire Netting Machines for Chain Link, Hexagonal Mesh, Poultry Netting, Field Fence. Crimping, Barb Wire and Staple Machines. Spring Coilers. Spring End Grinding Automatics. Loop Benders. Upholstery Spring and Wire Mattress Machines. Wire Nail Machinery. Chain Formers. Chain Welders. Straightening and Cutting Machines. Multi-Slide Wire and Strip Forming Machines. Special Machinery for the making of Paper Clips, Lock Washers, Bale Ties, Key Rings, Tin Openers, Wire Bag Ties, etc. Automatics for Flexible Metallic Tubing.

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WAFIOS

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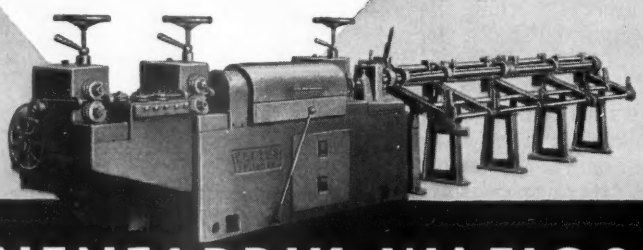

MASCHINENFABRIK WAFIOS

WAGNER, FICKER & SCHMID **REUTLINGEN 3 / WURTT. GERMANY**

See our Exhibit of the European Machine Tool Exhibition at Brussels, September 4-13, 1953, Hall 6 — Stand 6136.

Although much of the die handling for rectangular wire dies must, of necessity, be done on the enamel floor, the die components should still be returned to the die room at periodic intervals for inspection and refurbishing. The procedures for these operations are the same as outlined for the fine wire roller die previously in this article.

Die Room Requirements

Proper facilities must be provided for complete and adequate die servicing activities. A major portion of successful and profitable wire enameling depends upon the enameling dies and their continued proper operation. Considering the magnitude of present day enameling operations, it should be obvious that half-measures in regard to die servicing operations will not pay.

★ ★ ★

For the best results and efficiency, die servicing operations should be isolated from normal manufacturing operations. A separate space or room, devoted solely to die servicing work, should be provided so that skilled personnel, acting under interested supervision, can exercise their full efforts on this important task, free from outside and distracting influences.

★ ★ ★

Most of the larger wire manufacturers with wire drawing facilities maintain special facilities for the care and maintenance of drawing dies. In such cases the enameling die operations can be successfully integrated with the drawing die work. However, the wire manufacturer who does not have other die activities must still provide proper space and equipment if he expects to obtain the best efficiency from his enameling dies.

★ ★ ★

Figure 7. Typical die room layout. Conditioning of roller die fingers on bench in left foreground. Center bench for checking wiper type dies. Rear bench—left—checking roller dies on comparator—assembling roller die rods. * * * * * * * *

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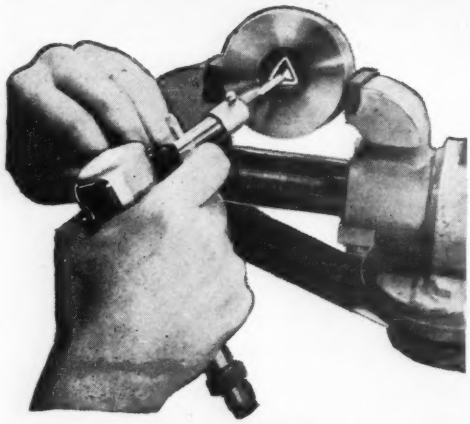

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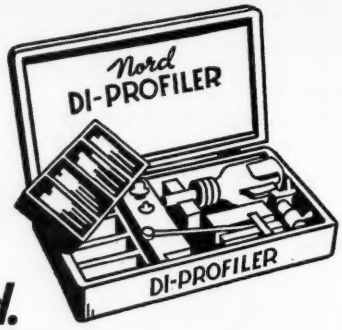

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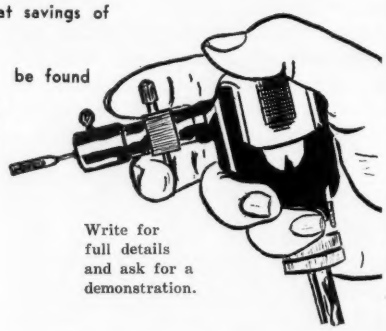

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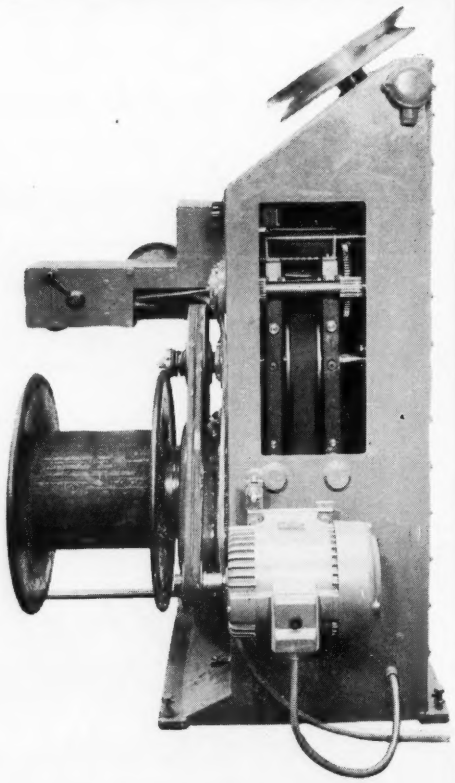

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An enamel die room generally requires a relatively small space as illustrated in Figure 7. Here each operator is provided with a good amount of space in which to work and all equipment and materials are kept accessible to the worker. Good lighting plays an important role in maintaining high die room output with a minimum of fatigue on precise die sizing and inspection activities. A room of this sort should enjoy good ventilation and heating systems, and the humidity should be kept as low as practicable, particularly in the summer months, to prevent rusting of dies and equipment.

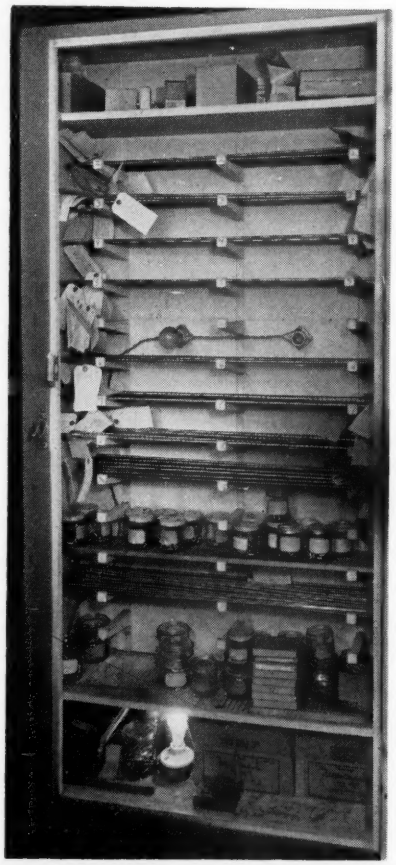

Figure 8. Heated cabinet for storage of wire enameling dies and components. Note die rod assemblies with identifying tops sorted on marked racks. Dies stored in individually marked glass jars. Heat furnished by light bulbs in bottom of back wall. * * * * * * * * * *

★ ★ ★

Clean and systematic storage facilities should be provided for long term stocking of dies and parts. Figure 8 shows a storage cabinet which is kept heated by means of several incandescent light bulbs mounted in the bottom of the cabinet. Here each item is properly identified and readily accessible to meet the demands of the manufacturing people.

★ ★ ★

All in all, good enameling die operations are simply the result of proper appreciation of the dies themselves, their applications and limitations. Common sense in die servicing and maintenance, backed up with the rigid enforcement of the practices that are found by experience to give good quality dies, will result in a minimum of delay and trouble to the enameling people. There is no reason or excuse why any die user should not obtain maximum die efficiency, which will result in minimum costs and losses, not only in the die room, but on the enameling floor itself.

Acknowledgment

The writer wishes to express his appreciation to the people of the Motor and Generator Division, Wire Manufacturing Section, Schenectady Works, General Electric Company for their aid and cooperation in the preparation of this article.

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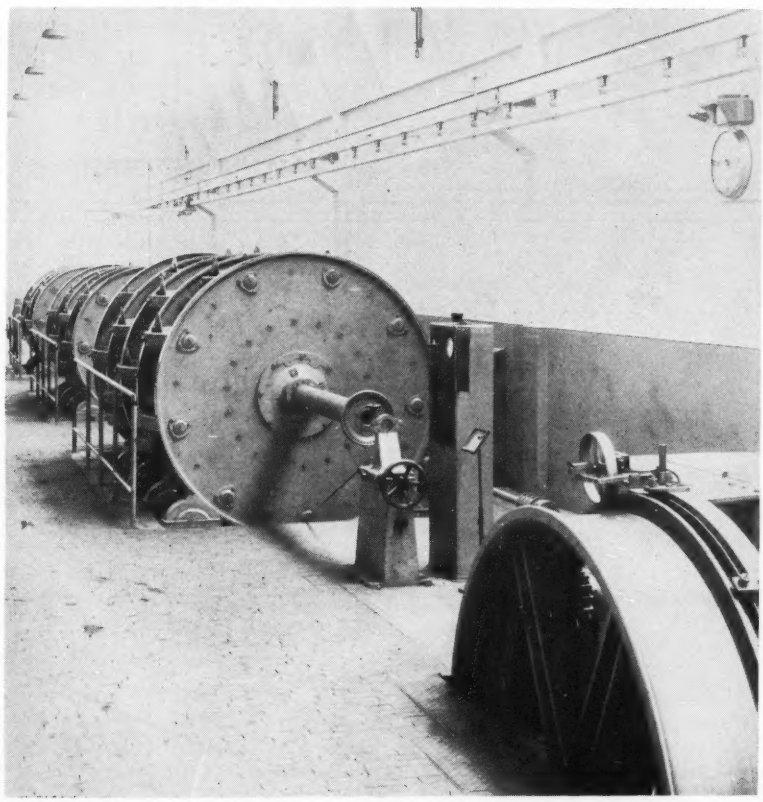

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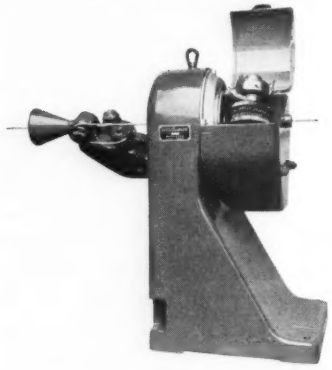

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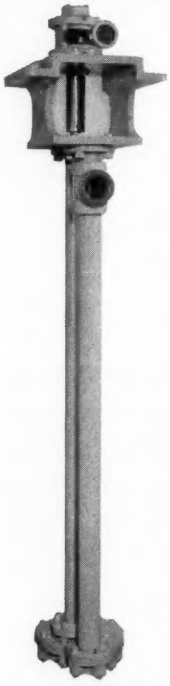

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Influence of Heat Treatment on the Properties of Drawn Steel Wire

(*Continued from page* 790)

interest (a) in the case of in-between annealing of steel wire to determine the drawing and the mechanical properties and compare these with the properties of the in-between patented wire from the same heat; and (b) to observe the behavior of the in-between annealed high-grade wire by one of the patenting processes following cold-working and/or compare its properties with those of twice-patented wire.

★ ★ ★

These researches were carried out with Steels 3 and 5 (Table 1) which were drawn from 5½ mm to 4.4 mm wire rod from which the rings were cut and half mild annealed (Steels 3 to 5) and half lead-patented (Steels 3a to 5a). All the wires were then drawn under the same conditions on multiple drawing frames from 4.4 to 2.2 mm and after each draft a corresponding quantity of wire was taken off for testing. The values resulting are shown in Fig. 6.

★ ★ ★

The percentage increase in tensile strength (Table 2) is appreciably greater for the annealed steel wire than for the patented. This follows essentially from the fact that with a higher carbon content the cementite was better developed. The comparison of the percentage increase of strength of Steels 3 to 5 with that of Steels 3a to 5a confirms that the greater cohering masses of ferrite show a greater strength by drawing than the eutectoid occurring ferrite. The variation of elongation values for the several annealed wires is similar, and the patented wires show agreement therewith, but the values after cold-working are somewhat higher for the low carbon steel in the patented state than in the annealed.

★ ★ ★

The torsion values however are

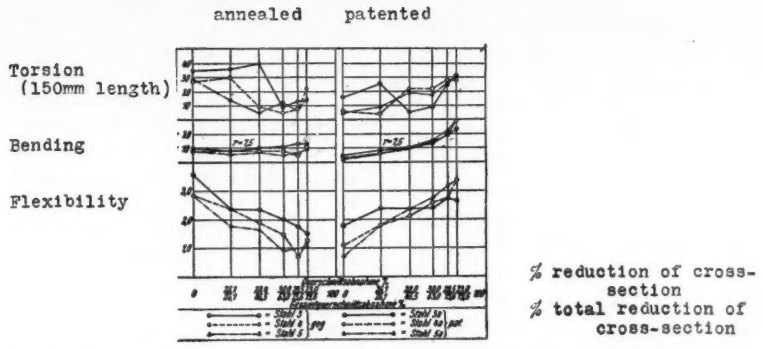

Fig. 6. Comparison of the mechanical values of annealed and patented steel wire of the same composition after heat treatment and after drawing. (geg annealed; pat patented.) * *

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otherwise. Before drawing, the mild-annealed wire shows considerably more torsional strength than the patented, which diminishes somewhat with increasing carbon content. After cold working begins the torsional coefficient of the annealed wire increases, yet the decrease in torsional strength, which appears with further reduction of cross-section, sets in earlier with increasing carbon content. With Steel 5 the decrease occurs indeed with the first draft. With further cold-working an increase in torsion coefficient occurs with all three steels, but irregularly.

★ ★ ★

Among the patented wires mild steel 3a shows after an initial rise a falling off of torsional strength with decrease of cross-section. With higher carbon content the torsional strength steadily increases with additional cold-working. The mild steel 3a shows the rise after the decrease of torsional strength first when the reduction of cross-section reaches about 50%. From the torsional behavior it follows that the form in which the ferrite occurs must be of decisive significance.

★ ★ ★

If one computes the strength in bending then here too the annealed steel shows different behavior from the patented. With the annealed wire the bending strength falls with increasing cold-working, while that of the patented wire increases.

Comparison of Annealed and Patented Wire with Wire Twice-Patented

Wire of 2.0 mm diam. of Steels 3 to 5 and 3a to 5a were patented by 880°/500° and drawn in nine drafts to 0.8 mm on a multiple dry-drawing machine, with a length of wire taken for testing after each draft.

★ ★ ★

In the structure of in-between annealed and then patented steel wire more globular residual cementite was observed, while the twice-patented wire displayed normal patented structure. The ascertained mechanical values (Fig. 7) show that also the in-between annealed and patented wire displayed final mechanical values after cold-working similar to those of the twice-patented wire. Although the strength after patenting of the in-between annealed wire was initially somewhat lower, after the first draft it reached the same values as the in-between patented wire. The variation of elongation values showed the usual picture, and the torsion coefficient also, after the first drawing, gave for both groups of wire about the same end values. The torsion values of the annealed and patented wires displayed principally reductions similar to those of the merely annealed wires shown in Fig. 6. Moreover it is striking that the richly ferritic Steel 3a in the double patented state shows here also the same kind of falling off as in the case in Fig. 6 with single patenting.

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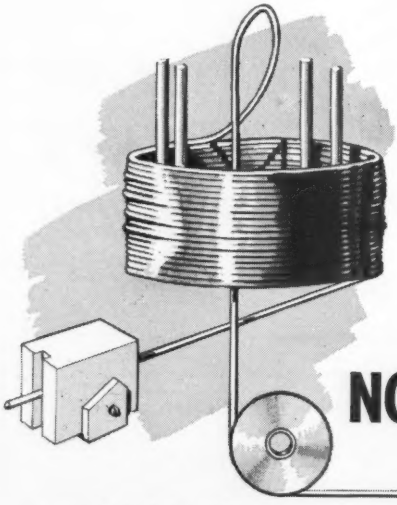
In bending, the annealed and patented steels show an impressive rise, fall and subsequent rise, and moreover with increased carbon content show an increase in the



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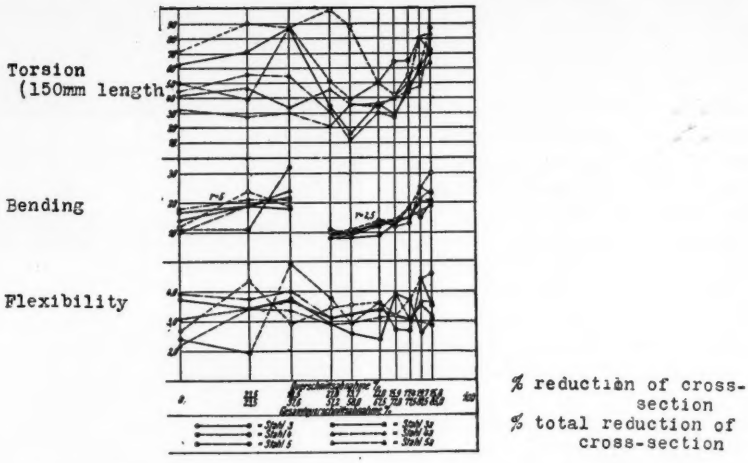

Fig. 7. Comparison of the mechanical values of steel wire which was annealed and patented with twice-patented wire, after heat treatment and after drawing. * *

highest and lowest values. The distinct slopes as they are shown in Fig. 6 between the initial and final values are lacking here.

The Behavior of the Mixed Structure During Drawing

Of the behavior of the pearlite and sorbite during cold-working by drawing, little is known. From experience it is known that steel wire with laminated pearlitic structure does not admit of a high degree of deforming, while patented steel wire permits as high a degree of deforming as wire with a ferritic structure. In Table 2 it appears that of steel wire of the same composition, the increase of strength by drawing in the annealed condition (Steels 3, 4 and 5) is percentagewise distinctly greater than with the patented wire.

★ ★ ★

Moreover, it appears that with increasing carbon content the rate of strength increase of the annealed wire is accentuated, while that of the patented similar wire falls off in spite of the fact that analytically similar wire was investigated in both groups and both showed consequently the same amounts of cementite. With regard to the determination made by W. Rohland, according to which the ferrite is the agent of deformation and with it the strengthening, now we nearly reach the conclusion that the manner of occurrence of ferrite is decisive for the extent of the strengthening to be expected from the cold-working of a mixed structure of ferrite and cementite. In pure carbon steels of low carbon content, the structure consists practically only of ferrite. This permits of maximum deformation by drawing whereby a very high percentage

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Suitable special tests show that a maximum tensile strength of about 170,000 lbs./sq. in. can thus be reached. If pearlite occurs along with the ferrite, then the deformation experienced by the ferrite is in part interfered with by the imbedded pearlite grains. With increasing deformation the pearlite crystals become turned in the direction of the drawing, and also the ferrite of the pearlite participates in the distorsion up to the point where the strong cementite flakes check it. By further reduction of cross-section the cementite flakes are destroyed and local fracture occurs with corresponding notch effect. The strengthening of the pearlitic ferrite up to this moment is, in consequence of the interference by the cementite flakes, not so considerable as with free ferrite. Nevertheless, apparently essentially caused by the notch effect of the fracture of the cementite, the rupture of the whole structure occurs before the potential strength and deformation by the ferrite can be developed. This is favored by the first appearing tension following upon the interference to deformation of the ferrite by the cementite. This conception can also be accepted respecting other cold-working processes.

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If a pearlitic steel is annealed and if the cementite is present in globular form, then the deformation of the surrounding ferrite can again be very considerable because the cementite, due to its spherical form, presents less interference to the distorsion of the ferrite. The research carried out with the annealed steels show also that only the ferrite is strengthened by the distorsion. A Pomp and H. Knackstedt have deformed a carbon steel with 0.03% carbon by cold drawing. By a 78.9% reduction of cross-section they were able to get an increase of about 108% in tensile strength. Table 2 shows that with an annealed steel wire with 0.69% carbon, after drawing with a reduction of cross-section of 79.6%,

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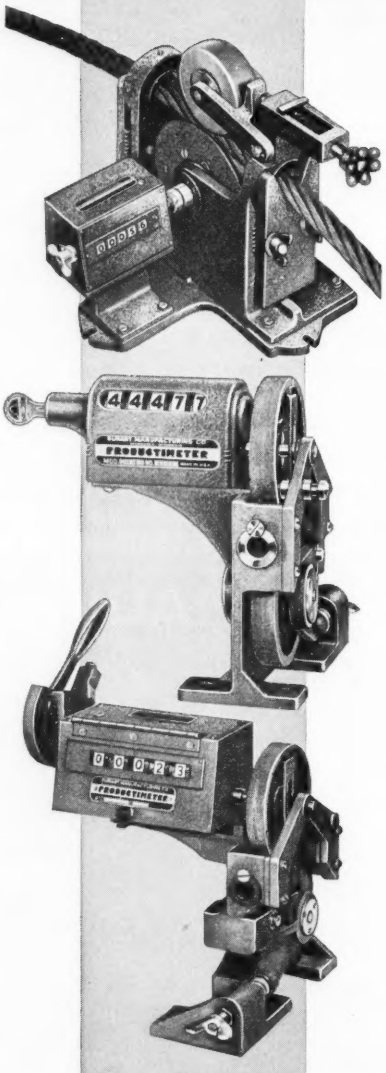

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an increase of tensile strength of about 119% resulted. Both steels show in spite of the very great difference in carbon content a considerable agreement in the increase of strength, that is, in confirmation of the above assertion that spherical cementite does not really influence the deformation or the strength.

★ ★ ★

A. T. Adam shows by photomicrographs of the highest magnification which were made of the structure of air- and lead-patented wire, that the sorbite of air-patented wire possesses a weak laminated development, while the sorbite of lead-patented wire shows a grain structure. Further observations in the same research were made of the photo-microscopic structure of patented wire, and from this it can apparently be taken that the cementite of the sorbite arising from the decomposition of austenite by lead-patenting is in general marked by laminations. This permits, as with the globular cementite, an extensive deformation of the steel wire; these short cementite flakes are however turned in the direction of the drawing with increasing deformation. Because of their short lamellar form they will leave the deformation and strengthening unimpeded longer than is the case with steels with a laminated pearlite structure. Along with the strengthening of the ferrite in itself there is joined here for the total strength the addition of the hindrance to sliding between the grains of cementite and ferrite. With equal reduction of cross-section the strengthening of the ferrite with increasing carbon content will appear less and less. The data in Table 2 are not in contradiction to this assumption.

★ ★ ★

For the behavior of the mixed structure of ferrite and cementite and the tensile strength aimed at, on the basis of the foregoing research then the following hypothesis can be stated:

★ ★ ★

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parently only the ferrite according to its development is plastically deformed and strengthened. Cementite in globular form hinders the deformation of the ferrite the least, while the lamellar cementite of the pearlite hinders it most. The cementite form originating from the development of martensite acts similarly, if account is taken of its finer lamellar form. The cementite of sorbite that results from lead-patenting takes a mid-position. The tensile strength obtained by cold-drawing of wire is a combination of the increased strength due to the plastic deformation of the ferrite plus the hindrance to sliding between the grains of cementite and ferrite, plus the strength of the cementite. From these observations it is also understandable that steel wire with an intermediate structure obtained by isothermal hardening, as a consequence of its manifestly more needle-like character, does not give improved mechanical values upon cold-drawing.

★ ★ ★

It must however be pointed out that in the special experiments carried out there resulted repeatedly significant plastic deformations which however did not also give an increase in strength, or at most only a little (Fig.8). If however one compares in these cases the increased strengthening by the preceding and the following pulls, one finds that either an above normal increase in strength had already occurred or that this resulted from the following draft. Since the plotted strengths are the mean of three always very closely agreeing tensile tests, it cannot be held that individual local differences have affected these phenomena. Whether this example actually corresponds to a deformation without strengthening will perhaps be settled by a more deeply probing research, as for example with the use of microhardness.

★ ★ ★

As above worked out, it is assumed that the tensile strength of steel wire determined by test is a combination of three compo-

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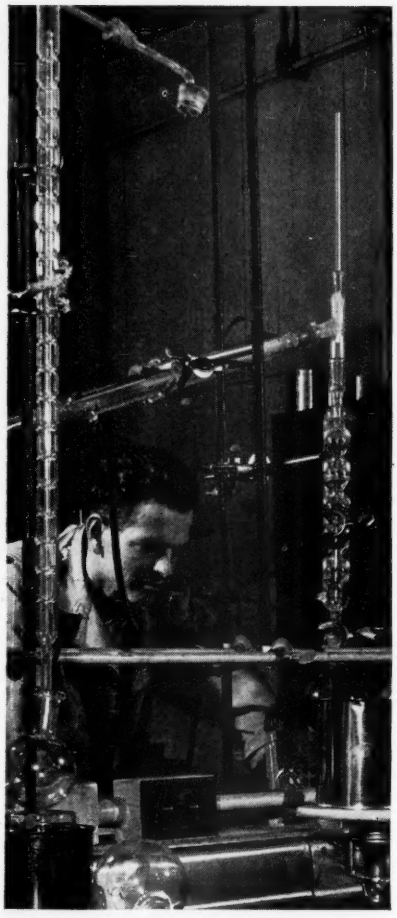

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nents. Now it could be assumed that as a result of undetermined causes one or more of these three components did not act in the assumed manner; for example, that the expected strengthening of the ferrite did not occur, or that a displacement of the sliding movement occurs between the ferrite and cementite in the pure ferritic zones; also it is still to be proved if through micro-fractures resulting from the tensile tests the strength of the cementite may not come more fully into account.

★ ★ ★

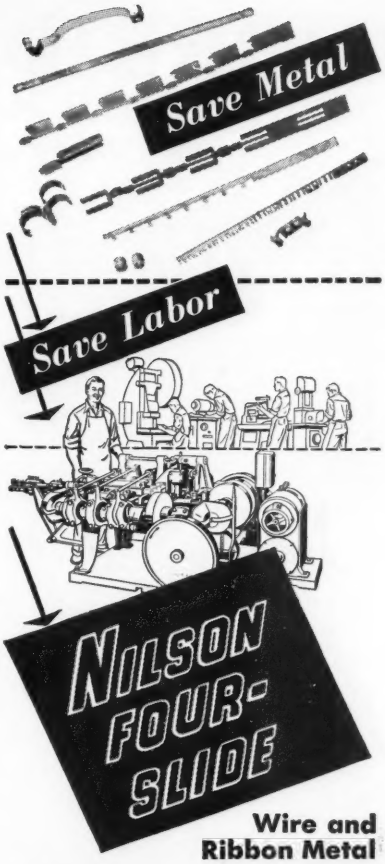
By M. Bonzel and other investigators it has been observed that by the drawing of steel wire, after a reduction of cross-section of about 60%, a diminishing of the torsion coefficient occurs. A. Pomp and H. Ruppik trace this to a large grain size of the sorbite which opposes locally an increased resistance to the torsion of the material fibers and thereby counteracts the favorable influence of the stretching of the fibers. In the special experiments with annealed steel wire a falling off of torsional value was likewise observed, which with increasing carbon content occurred with continually less total reduction of cross-section. As the predominant portion of the structure of annealed steel is ferrite and the steel most rich in ferrite shows this falling off most signally, the observed behavior must with approximately equal development of cementite be traced principally to the ferrite.

★ ★ ★

Through the increasing quantity of cementite which as such hinders the deformation in the other direction, the falling off of the torsional value is so much earlier to be expected as the carbon content is higher. Further research in this direction is in progress.

★ ★ ★

The patented wire also shows a similar behavior in torsional experiments. Steel wire with low carbon content shows at first after a small reduction in cross-section through cold-working a maximal torsion coefficient and a falling off of the same by further deformation. The short lamellar cement-



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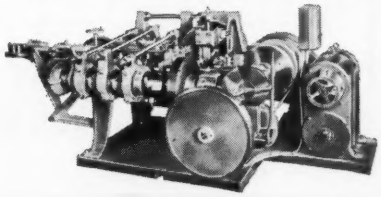

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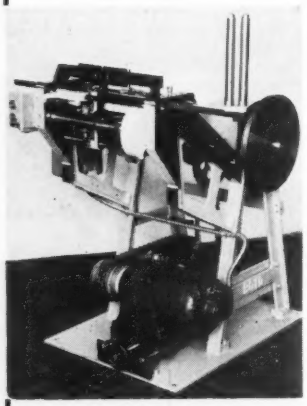

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ite behaves in this case like the globular cementite of the annealed structure. With increasing refinement of the structure this reduction of torsional value appears less significantly. With higher carbon steel it is even less in evidence (See Fig. 7). Respecting the influence of the mixed structure of patented steel wire upon the bending strength nothing in the literature is known to us. From the foregoing research it appears that the bending strength by the existence of a structure of precipitated ferrite and pearlite lies definitely lower than with a patented structure that shows no lamellar pearlite. Since it is to be assumed that the cementite itself is not plastically deformed, with respect to the alternating tension and compression caused in a back and forth bending test, it is to be supposed that an essentially different mechanics of strengthening is operative than is the case in simple bending. A not negligible significance therefore attaches evidently to the action on the boundary surfaces ferrite-cementite.

Summary

The course of structural change of two specimens of steel with 0.48 and 0.74% carbon was observed during patenting. The determination of the necessary austenitizing temperature resulted from tempering experiments, and for both specimens the isothermal transformation diagrams were obtained whereby the influence of the austenitizing temperature on the position of the transformation curve and the development of the structure is investigated. Further, the conditions were determined under which a pure sorbitic structure is obtainable and the form of development of the sorbite is briefly discussed. The influence of the structures produced by different oven temperatures was clarified by tests on the same steels, whereby among other things the effect of larger amounts of ferrite on the drawing behavior of the wire as well as its mechanical properties were also observed.

★ ★ ★

Likewise through practical

working tests on three other steels of 0.34, 0.53 and 0.69% carbon content, the influence of one of the annealing processes prior to cold-working on the mechanical properties was compared with those of patented wire. The research extended to the comparison of the mechanical properties of annealed wire and that patented after cold-working with twice-patented wire, whereby in this connection the behavior of the mixed structure ferrite-cementite during cold-working is observed. A working hypothesis was put forward respecting the components for the development of maximum strength. A deformation not accompanied by strengthening was also revealed by these experiments, for which an explanation was attempted. Likewise with associations which exist between the mixed structure ferrite-cementite and the torsional or bending values after cold-working.

Potential Markets for Western Wire Fabricators

(*Continued from page* 781)

I understand many of you have been concerned with wire rope and the distribution problems connected with this product. Today, I believe, most of you visited Columbia-Geneva Steel Division's wire rope mill at Pittsburg Works. Actually the wire rope market has changed quite a bit since that mill was built in 1941. The huge construction programs in the West were not contemplated in 1941, at least in the magnitude that has developed. The logging industry, a major user of wire rope, did 40% more work in 1950 and 1951 than it did in 1940. The oil industry and mining industry, also wire rope users, have been considerably more active in the last several years than they were in 1940. Wire strand, also fabricated at the rope mill, has found increasing markets in the electrical industry, in the oil fields and in aircraft applications. Competition, as you know, is particularly keen in the rope and strand markets, keep-

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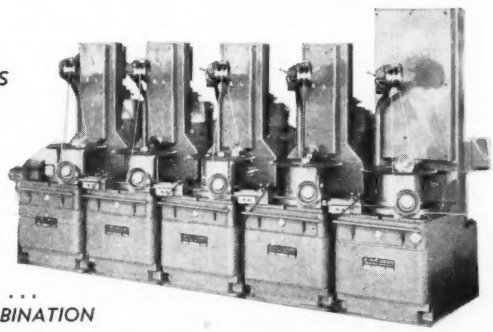

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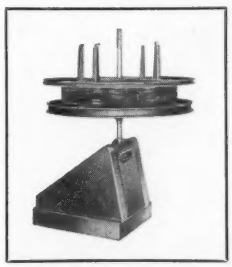

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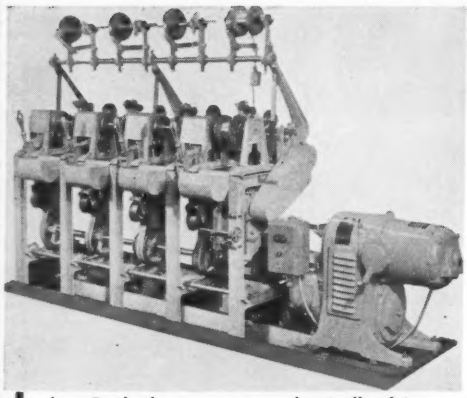

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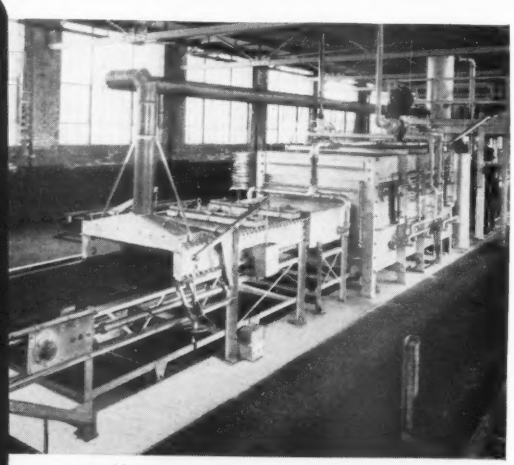

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ing all producers constantly on the lookout for new markets and new uses for their products. Prestressed concrete has been one of the fields in which wire rope and strand fabricators have been taking an active interest.

★ ★ ★

Another example of the rapid growth of the past few years in the West has been in the fastener industry. Many of the industries we have discussed tonight use vast quantities of bolts, screws, rivets and other metallic wire fasteners. Before World War II, there were a few small plants in the West manufacturing the heavier sizes of fastenings, but the volume was small and most manufacturers and jobbers had to rely primarily on eastern sources of supply.

★ ★ ★

With the increasing industrialization of the western area, the demand for such products has grown rapidly. During wartime, specialized fastenings are required in large volume by the aircraft plants in addition to the demand from new and enlarged plants making civilian consumer items. This has fostered the growth of fastener manufacture and at the present time, there are quite a number of plants making a wide range of items. Although adequate statistics are lacking, it appears that the bolt, screw and rivet industry in California is more than twice as large now as it was before the war.

★ ★ ★

Now let's look to the future. I would like to spend a few moments indicating those industries which in our opinion hold particular promise for you in the fabricating business in the West.

★ ★ ★

A few minutes ago, I mentioned the tremendous growth of the automotive industry in the West. When most of us look at a car I wonder if we ever give any thought to the amount of wire that goes into its manufacture. Think for a moment of the springs on the carburetor, the electrical system throughout the car, the springs in the seats and backs, the number

of rivets, bolts, screws and miscellaneous fasteners that hold it together. Altogether, about 187 pounds of wire are used in the late model automobile. Multiply that by 650,000 assemblies in the West and you will find the total to be about 60,000 tons. Most of these parts have been fabricated in the East with the exception of the seventy odd pounds used for seat cushion assemblies. This leaves an effective future opportunity for 30,000 to 35,000 tons of wire fabricated parts for the western auto industry.

★ ★ ★

In spite of the extensive developments that have taken place, the West now produces less than 4% of the fasteners manufactured nation-wide. We estimate that our consumption of fasteners is in line with our share of the nation's industrial production capacity. This totals approximately 7%. Therefore, it appears that the potential of the fasteners industry in the West is almost double its present size and that growth will continue into the future at a rate comparable with that in the past five years. By 1960 our local capacity should by and large meet the requirements of the area.

★ ★ ★

Among the many uses for wire, some of the most important are found in the home—as we have already discussed. Naturally, items of this type are directly affected by the population growth, new housing, and industrial activity. Many innovations have appeared on the market in recent years, particularly in relation to modern design and modern living, and are familiar to all of us. The changes in household items are the result of much ingenuity, and an appeal to simplified living. The pattern of likes and dislikes has changed considerably in the last decade, and with these changes, manufacturers must also shift their thinking to accommodate the markets for new products. As an example, I doubt very much if most of us would have had the courage in 1940 to forecast the tremendous boom in television, and the wide distribution of receiving sets in

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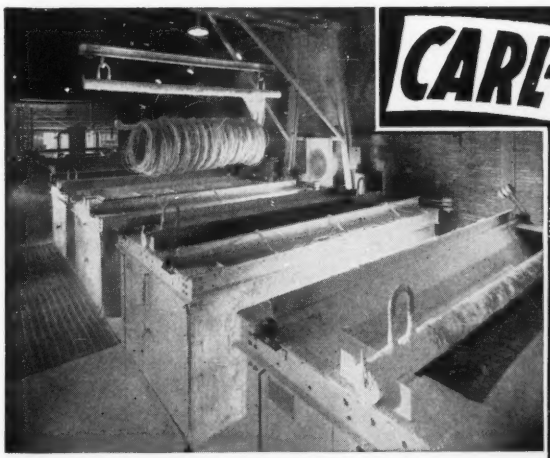

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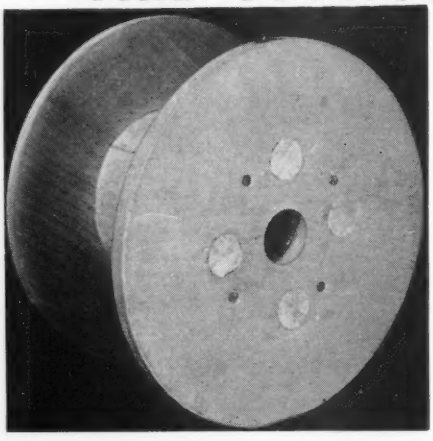

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even the smaller homes. One has only to observe the forest of television antennas above most of the large housing developments to appreciate the quantity of wire used in the antennas as well as the sets themselves. This market—the consumer goods field—holds much opportunity for us in the West as the area continues to build roughly 20% of the residential housing constructed in the nation.

★ ★ ★

We also see continued expansion in the electrical industry. This field is a relatively new one as compared to industries such as iron and steel. As a result new uses and equipment are constantly being developed. The field of electronics is a branch of the electrical industry that is still in its infancy. The West is fast becoming a major factor in this field.

★ ★ ★

A market area that has not yet been thoroughly explored is the field for prestressed concrete and prestressed ceramics. Recent experimental work has indicated that great savings can be made in construction projects by using concrete that has been stressed with high carbon wires, thereby giving greater strength to concrete structures such as buildings and bridges and eliminating the need for huge steel beams that are both expensive and, in recent months, difficult to obtain. A great deal more must be learned about the prestressing of concrete and ceramics, but the possibilities that exist for the use of these new products is varied.

★ ★ ★

In summarizing these discussions on western wire fabricators, I believe we can say that the future growth and opportunities are tied closely to continuing population increase and hence expansion of the market for our products in the western area. We can also point to the innovations and technological advances that are being made in our modern society. These factors are adding greatly to the potential of our industries—those manufacturing and using wire products. I might also point out

several factors of a more specific nature such as the growing disparity in costs between manufacturing a product in the East and delivering it to western markets vs. the cost of local production and the local freight charges. Also steel ingot production in the West has increased 310% in the past eleven years making the West less dependent on eastern mills for steel. Wire drawing has also increased proportionately, making wire products more available and better service possible. These trends are destined to continue. With the West a natural marketing area of a size which will maintain many types of manufacturing and fabrication hitherto uneconomic, there is indeed no reason to fear the future. I hope this brief discussion has pointed out to you the prospects as we see them. It is our joint task to prepare for these developments and continue to meet the needs of the growing West.

Wire Rope Origin and Development

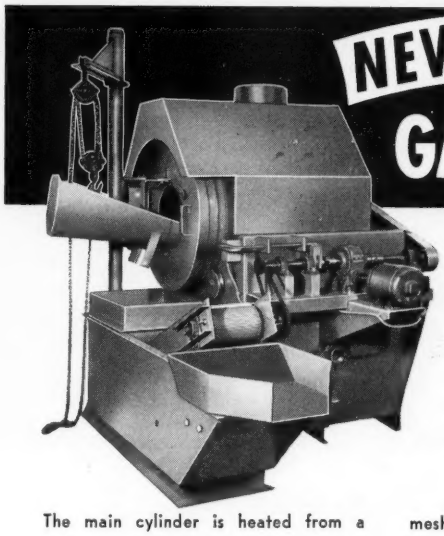
(*Continued from page* 778)

improvements have come after the wire mill product was improved and better wire stock became available to work with. As an improved product was marketed, engineers designed new equipment calling for greater and greater strengths with more and more flexibility. As field operating conditions changed and a greater understanding of these condition requirements became known, constructions of strands and variations of individual wire tensile strengths were made resulting in a superior all-around product. Such changes are going on today as field conditions change, and will undoubtedly continue to change in the future. Nothing is static.

★ ★ ★

Not too many years ago, the process of preforming was developed. This process which consists essentially of prestressing the individual strands into the helical shape they will finally assume in the finished wire rope is actually, I believe, the most important contribution to wire rope field service

NEW NAIL GALVANIZER



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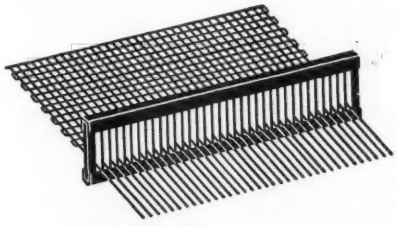

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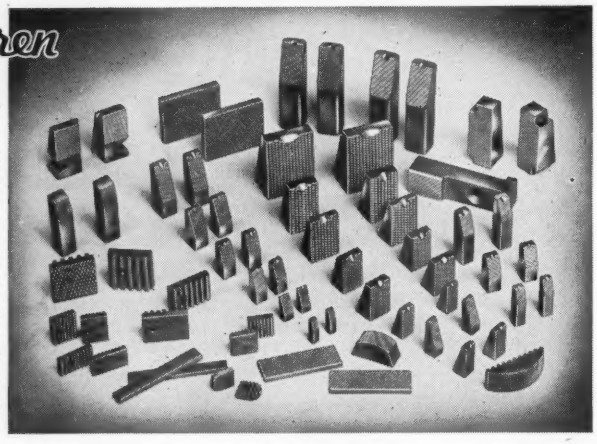

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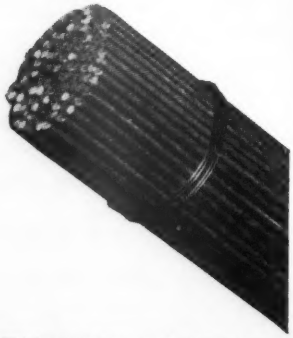

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which has been developed in the rope shop itself.

★ ★ ★

There have been improved wire rope stranders and closers developed over the years, but largely this improvement has been one of operating efficiency rather than change in product design.

Basic Problems—Wire Rope and Rope Wire

Wire rope today is classified primarily into two main catagories as far as breaking strength is concerned:

1. Improved Plow Steel—245,000 lbs./sq. in. and up on an average.
2. Plow Steel—245,000 lbs./sq. in. and downward on an average. A few years ago, several wire rope grades were in common usage with the tensile range proscribed between fixed limits. Today, however, these breaking strength ranges have been replaced by a sliding scale curve, which decreases the tensile requirements as the diameter of the wire itself increases. From the wire mill standpoint, this is a far more practical approach than a fixed tensile range irrespective of wire diameter.

★ ★ ★

From an historical standpoint, the terms used have grown over the years as wire itself has developed and improved. The original terminology "Plough" steel, was used to designate the patent steel wire developed for John Fowler of Leeds, England, for use in agricultural steam ploughing ropes. "Improved" and "Extra Plough" were added as tensile strengths were further increased. As short a while back as twenty years ago the wire rope industry had five major tensile classifications: Improved Plow Steel, Plow Steel, Extra Strong Crucible Cast Steel, Crucible Steel and Iron. Today, by far the greater portion of wire rope marketed is Improved Plow and Plow Steel grades, although some quantities of Mild Plow Steel are still distributed to the cable tool drilling operators and some iron grades in the marine field.

★ ★ ★

Again—coming back to fundamentals— the basic problems in the wire rope field must be solved largely in the wire mill itself. A wide range of physical properties can be produced in steel wire by means of chemical composition,

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heat treatment and cold working. The heat treating of the steel itself is designed primarily to produce in that steel the physical condition best adapted to cold work. Since cold work greatly increases the hardness and tensile strength of the steel, it is actually a magnifier that will emphasize irregularities in the quality of the steel as well as faulty practices in heat-treatment and wire drawing. This influence becomes progressively greater as the carbon increases, which explains the very great degree of control which must be exercised in the production of high carbon rope wire.

★ ★ ★

This brief discussion on wire mill practice is not for the purpose of educating you further on your own problems which you know far better than I—but rather to develop a point which is of utmost importance to wire rope manufacturers and users. Wire rope, when in normal use in the field, is subjected to terrific strains and shock loads and under conditions which in many cases amount to outright abuse of a precisely engineered product. Responsibility for safe performance in spite of poor operating conditions is always in our minds because human lives are involved as well as costly machinery and equipment.

★ ★ ★

It was mentioned before that a wide range of physical properties may be developed in the wire mill depending upon the chemical analysis of the steel, heat treatment and the amount of cold working performed upon the wire. This point I would like to impress everlastingly upon each and everyone of you men involved in wire mill control—

(1) Tensile strength alone is not the measure of a satisfactory or even safe wire for wire rope usage.

(2) Torsion tests, while the only present production method of testing rope wire ductility, is still far short of being a reliable gauge as to rope wire service in the field.

(3) Steel wire for use as rope wire must have left in its finished state a degree of cold-flowing capacity remaining in the wire—not for the purpose of further reduction—but rather to enable it to adjust itself to the deformations and severe operating conditions which will be imposed upon it while in service in the field.

★ ★ ★

7 out of 9

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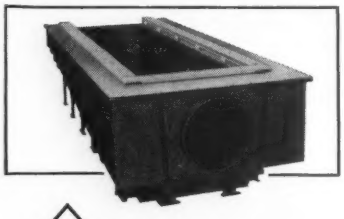

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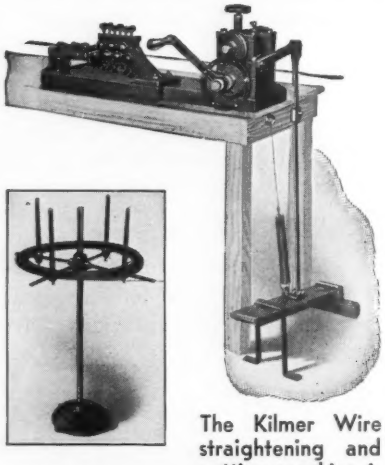

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The best example of this point I am trying to make is that of the Mt. Hope Suspension Bridge, constructed in 1929 over the Narragansett Bay near Providence, Rhode Island. On this bridge was being used a new type heat-treated wire which was supposed to possess advantages over the cold-drawn wire always used before in such cables. The Bureau of Standards had made exhaustive tests and laboratory examinations of this new type of wire in which the required physical properties were obtained largely by heat treatment rather than cold working. Tensile and torsion tests were definitely superior. The bridge was built—as it neared completion it was found that many of the wires had broken at the anchorage shoes. An immediate check found the wire breakage so numerous and serious that the whole bridge was dismantled and rebuilt with ordinary cold drawn wire.

★ ★ ★

An exhaustive study was made of this very peculiar failure under what can only be considered a moderately light load. It was eventually discovered that this heat treated wire which had passed rigid laboratory inspections so easily, failed due to one cause alone. Where the wire fitted over the anchor shoe, the stiff wire failed to completely adjust itself to the contour of the shoe and as the load came on and off the wire it bent back and forth at the shoe —and under repeated bending this type of wire failed due to steel fatigue!!

★ ★ ★

Make sure that the rope wire you produce in your mill, has plenty of guts left in it when it goes to the rope shop—it will need every bit it has when it reaches the field ready for usage.

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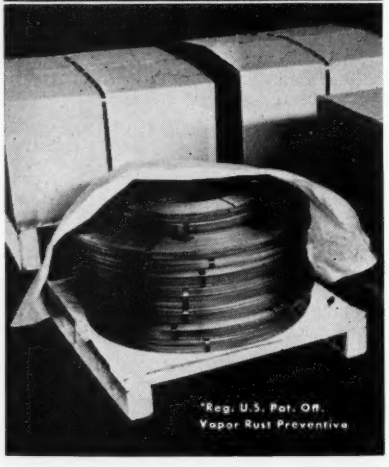

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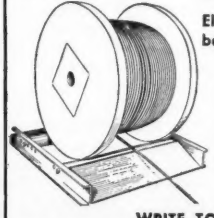

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rope shop design which will produce a better product and produce it more cheaply. It is to the wire mill, however, that the largest portion of this challenge is thrown. When a better wire rope is made, it is the wire mill which will produce the wire which will make it possible. There are larger buildings to be built, bigger mountains to be moved, greater rivers to be spanned and deeper oil wells to be drilled—all waiting and clamoring for a better product than we have produced thus far—it ill behooves any of us to rest on our laurels.

★ ★ ★

And now I have reached that point where I find myself in the position of George, the negro prize fighter. George had stood a terrific pounding for eleven rounds. In the twelfth round George "got it" on the button and found himself flat on the canvas. One of his enthusiastic vocal supporters shouted, "come on black boy, ain't y'all gwine to fight no more?" George slowly opened one eye and replied, "yassah, I'm gwine to fight some more, but not tonight."

Inhibitors vs. Accelerators
A Symposium

(*Continued from page* 793)

sample of the water from the area concerned might be the first approach to supplying an inhibitor.

MR. DOUTY: A good suggestion!

A MEMBER: We had such water in the summer time that it has been necessary for us to install a water filter to keep our pipes open.

A MEMBER: We have trouble in our pipes filling up with lime. We have high calcium water.

MR. DOVE: Now, we have two conditions. With variable water throughout the year, that is going to make it a little worse. Bill has the difficulty that in their water it is considerably lower in organic matter in the spring than the rest of the year. We in our case, on this Island, we have much more organic matter at the times that the pulp mills on the Upper Ottawa are shooting in the by-products from their pulp and paper business, well up some one hundred miles to the north. So there is a changing water condition that should really be examined before you choose an inhibitor. You might have to change the inhibitor during the different times of the year.

MR. DOUTY: I hope we can make a thing that won't be that sensitive. I am quite sure that I have got an inhibitor that will work as far as its

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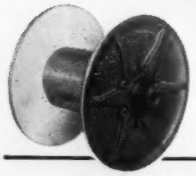

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strength goes in any of these water conditions. However, one has to realize it isn't always in every particular instance that you care to have absolutely the strongest inhibition you can get.

A MEMBER: I wonder if anyone has a similar problem to the one we have. Has anyone tried an inhibitor with an accelerator?

MR. IRWIN: I can answer that partially. Time and again—just demonstrating what this darn stuff will do—I have walked in on a tank that was high in iron and just on its last legs prior to dumping, you might say, with the polarizers in the tank; and I have given it an extra shot of a depolarizer, added more acid and carried that bath at normal pickling activity for some time and then let it kill itself off at a higher acid and lower iron. The two ideas are opposed. Depolarization is a means of releasing hydrogen—to get the hydrogen away; the hydrogen wants to cover up the corrosion cells, but the depolarizer wants to cut those corrosion cells so at the normal life of the bath with a polarizer present, you have the effect of the polarizer and the high iron content that is always depressed at that point. If you add a depolarizer you apparently do give that bath a new lease on life for a while because it eliminates the thing that is holding the bath back.

A MEMBER: I bring that up because of our peculiar operating conditions. We had in our cleaning house for a period of two years a system such as that, through which we kept records on acid consumption for that period. However, that was not the primary reason why we did it. Unfortunately we were on a trout stream and we had to use approximately a carload of lime a month to see that the trout were not killed. We have an elaborate Dorr separator to get rid of our wastes; and we ran our cleaning plant or house that way for a two year period in which we worked our concentration up to 12% iron and about 1% on acid when we dumped them.

MR. IRWIN: That is one way that depolarizers can be used in this industry. You can run your bath, probably starting with a weaker acid concentration to begin with plus a depolarizer and a lower temperature, assuming you can handle speed and more production. You can carry along with that level and only add as much acid as you normally do to build up the normal amount of iron; but on the way down you can carry that bath down with a depolarizer to 1% or less if you have the time to do it. But you do get efficient pickling for a much longer time on the way down; and then you can dump.

Another way that has been used is to run the iron up quite high, add enough acid to end up with a very high iron content in the bath and then kill off; and in that killing process you do get more active pickling on the way down with a depolarizer. One argument against that, in some plants, has been that when you get 14% Fe by weight in the tank, by the time you translate that into $FeSO_4.7H_2O$ you have a very high content of iron sulphate in that tank and it drags out on the work. It doesn't rinse as thoroughly as it did in the first place and it involves the use of extra cyanide dips to remove that iron prior to further drawing.

A MEMBER: The gentleman here has brought up a problem that is probably

not directly associated with inhibitors and accelerators, but I believe it is one the industry had best be equipped to face for it is certainly coming. He mentioned he was on a trout stream. Also your Panel in discussion mentioned cost-quality production. However, I think two other big things that are coming into that are public opinion and government control; and I wonder if the time that is now being spent on research would not be better spent in finding some cheap solution for elimination of the dumping of acid in the trout stream and taking off your iron as a sludge.

MR. DOUTY: There is a tremendous amount of effort being spent on that as everybody here knows; nobody has found a method of disposal of waste pickle liquor that does not cost money. There are plenty of methods of disposing, if you wish; but it costs money for they don't support themselves. Now, by the use of inhibitors you pickle more steel in the same amount of acid pickle bath, so you have less of a disposal problem.

MR. IRWIN: I have figures that show you can get more tonnage out of an accelerator bath.

A MEMBER: In answer to this gentleman's question about money being spent on research on acid disposal, I know of two major research organizations in the States—the Mellon Institute and the Battelle Institute—that have spent years on this one problem. I know of one company that is out of business because it poured all its money down the drain trying to work out this same problem; further, there are at least two major steel corporations in the States that have actually put in different types of pilot operations on their stream pollution problem for acid disposal; and as Mr. Douty said, they have never paid their way. In effect they cost more than just the plain, old neutralization.

A MEMBER: Does that place the industry in the same position as Mr. Lewis—you are going to put in an oil burner? There are other methods of cleaning which are developing and they are developing at a very rapid rate; and I would say that the pickling industry and allied industries have got to come up with an answer within the next ten or fifteen years, or it is going to find no market for inhibitors and accelerators.

A MEMBER: We are in a lot worse position than you because we have a definite time limit to meet—just two years. The only major solution that has been achieved by any steel company in our area has been the purchase of a tanker—a motor tank fleet—to haul out the acid and neutralize it on the slag dump; that is the most economical way to get out of the whole problem.

MR. DOVE: Bill, what would you figure it costs you in your locality?

A MEMBER: I never quite figured that way; we are coming close to having it pay its own way in this respect: when we dump a tank of acid we don't put it through our separator; we put it out in the lagoon and allow the iron to settle and we finally found a way of selling that iron.

MR. DOVE: You haven't got a good dye works around your place?

A MEMBER: It is used in a cleaning industry.

MR. IRWIN: It seems logical and practical to take a higher iron acid so-

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lution and freeze it; that is, actually put it through a refrigerating system in connection with an outside tank and drain off the acid solution from there. That will give you an acid solution containing a very low quantity of iron that could go back; acid could be added to it, and it would be a regenerative process.

A MEMBER: One major steel company investigated that and has written it off as being impracticable due to the refrigeration cost.

MR. DOUTY: The objective in this thing—besides the economic objective—is to preserve the sulphuric acid. We were short of sulphur for a while; and the need was borne home to all of the fellows here. Now, you do find you recover copper for which nobody has any particular use; but you still haven't done anything to preserve your sulphuric acid. Surely one can roast and then calcine copper and, theoretically, recover the sulphur trioxide—but nobody wants to put up the dollars that it would cost; it is an expensive process indeed. So the fundamental problem of regenerating the pickle liquor completely, doesn't have any present solution or one in the foreseeable future, economically. Whatever is done will be done because of government pressure, because of regulations, because we must stop stream pollution—and not because it pays.

MODERATOR DOVE: I might say that a few years ago I gave a paper on electro-pickling. I was surprised later to receive a gentleman one day from the New England State Fisheries Board, who landed up in Hamilton. I couldn't figure who in the New England State Fisheries Board would want to talk to me; but this chap came up and he said he was very interested: "You published a paper on pickling and I noticed that the acid content of the material you put down the drain was very low. I want to know how it is worked." We gave him all the dope and he went back; but that shows that the government agencies are following every article they can find just to see themselves some way of doing it cheaply, so they can make recommendations to the industry.

A MEMBER: Up to the past seven years we were making our disposal of our pickle liquors by recouping the iron sulphate; we find it more economical at the present time, under our present system, than we did on the other system. The gentleman brings up the question of public relations. As far as the streams are concerned, we are hampered in Connecticut. When this stream of ours is stocked with trout we have a State Inspector at the plant every day taking a five-gallon sample of our water that goes back into the river.

MR. DOVE: Is anybody here that has used inhibitors in continuous pickling for galvanizing? I am thinking of wire galvanizing particularly, right now. Any one here using inhibitors in continuous pickling for galvanizing?

A MEMBER: Yes, but just in the welded fabric.

MODERATOR DOVE: Any one using inhibitors in processes that require liquor copper coating or tin coating?

A MEMBER: We have in tin plates where we are using inhibitors in con-

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MODERATOR DOVE: That is an alkaline bath and your organic materials would be removed by alkalinity there. In the other case, I am thinking of plating by virtue of the electromotive series —copper dip for example. Bill says he is using it.

MR. DOUTY: One manufacturer for whom our company manufacture a product—copper coating wire and other things—one ingredient is an inhibitor; the whole composition consists of copper and certain salts and an inhibitor and it produces on pickle work a rather fine tightly adherent copper.

MODERATOR DOVE: It is used as a refiner for the copper?

A MEMBER: It is—the wire in general is always pickled prior to coating.

A MEMBER: It has been my experience that some people use inhibitors prior to liquor finishing and some don't; and those who don't are quite outspoken on that point. From my own observations I would say that you want to be very careful if you use inhibitors prior to liquor finishing, because the tin alone will slow down your copper; if you add an inhibitor you slow down the tin more than you do the copper. I don't think inhibitors are a good thing in connection with tin or copper. Copper alone is not affected by it.

MR. DOUTY: We have been able, on a laboratory scale, to give a liquor finish in the presence of inhibitors, but I am frank to admit we have not yet been able to perfect that for commercial operations.

A MEMBER: We had an experience in our liquor finish with a similar type of chemical phosphate finish. We would pickle in hydrochloric acid and we tried to do it in sulphate, but we couldn't because of that sulphate.

MR. BILLINGSLEY: You have to be very, very careful there; there are only certain inhibitors that you can use for sulphate coating. They are in a minority, a class by themselves.

A MEMBER: Getting back to pickling and accelerating, as I understand your depolarizing theory, you want to remove everything from the surface of the steel and swish the scale off the surface. What do you do with rods where you have the scale unevenly distributed, for surfaces that only have a little scale?

MR. IRWIN: I think we keep swishing that steel off at those points where the steel is open; but I don't believe it is anywhere near the rate in actual production that might be indicated in some laboratory tests. I base that on some of the outstanding production figures we have had on savings in acid consumption in rod pickling. Perhaps some of it is saved because we are not eating off the scale, if I may use that word. The scale has cracks through it down through which your acid attacks the base metal and tends to form hydrogen and that hydrogen that has formed does have a blasting effect on the scale to help remove it. There is one other thing: we have all forgotten as far as this depolarizing theory is concerned that this scale on there is cathodic in

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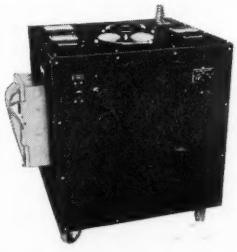

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relation to the steel. Just those two materials in salt water alone will develop quite a current between the scale and the steel. If it were just in salt water you would tend to corrode and probably pit the steel very deeply because of a large cathode area in relation to a small anode area. With the depolarizing principle, if we can eliminate the hydrogen faster,—get more outward pressure from the steel surface from that hydrogen—one quantity of hydrogen can do more work toward removing scale than twice as much under any polarizing condition. You tend to get reduction down here and you undercut your scale. One of the finest examples of that is in using depolarizing in the acid bath and watch that scale turn up its toes and come to the surface of the bath very rapidly. But if you have open faces and you are contacting that surface, you do get a greater rate of attack per unit acid concentration. We normally prefer to work with only 80% of the normal acid concentration, one of the reasons being that the less slow-down, the more the base metal takes care of it.

A MEMBER: What would you do in the case of strip pickling where you normally have heavy scale concentration on the surface of the strip and relatively little or no scale toward the center of the strip?

MR. IRWIN: I would be inclined—and we expect to run tests on that—I would be inclined to go to the highest speed I could get. But I would do this on a continuous pickler. You have normally any where from 2 to 4 or 5 baths, as you know. The acid flow through the bath is usually in the opposite direction to the flow of the work; if the work is flowing one way and the acid in the cascading system in the opposite direction, most scale enters the tank that has the highest iron and the lowest acid,

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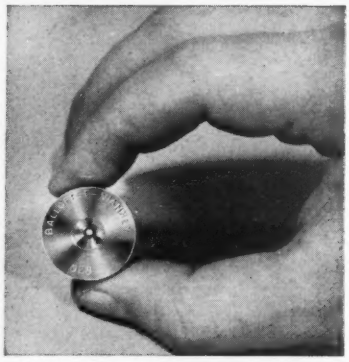

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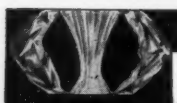

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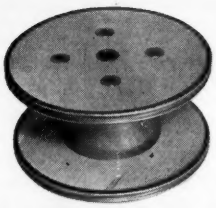

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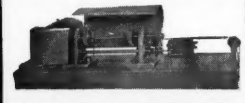

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and less scale goes into the tank that has the highest acid and the least iron It is just plain backwards. So what you really should do in that setup is to use controlled depolarization in the tank to slow down the action, maintain the depolarizing factor; in a sense, inhibition. This slows down the action where you don't have much scale. High temperature and high acid concentration produces the greatest solubility of those iron oxides in high clean acid. There is then a chance for the chemical action to take place in the tank. Where you have a lot of scale, a lot of iron in solution and a low acid—that is the place where we use a very high degree of acceleration to blow that scale off in the first tank. You make better use of your acid, can operate at higher iron concentration, cut down the rate of flow through your tank and still get the normal effect in the finishing tank on the exit end. Now, in relation to polarizing practice in the straight polarizer, polarizers used in those tanks will operate at 220 degrees F., as most of the big mills do. The organic matter doesn't stay put very long and, concentrated, it may be 30% sulphuric. But that is the place, to my mind, to get good chemical action on deep-seated scale.

MR. BILLINGSLEY: I would like to ask two questions. First, the inhibitor in the back tank—is it a 3 tank or a 4 tank cascade system? There are inhibitors that you know, including ACP, that will give you an inhibition of 90% running at 220 for two hours at least. They put in inhibitors every hour or so and have sufficient protection in those 3 or 4 tanks to get at least a round figure of 90%. That is my first question and I have answered it myself. If my friend has any comment to make, I would like him to make it.

Second, if the hydrogen does such a wonderful job on the blowing off of the scale, I wonder if he would tell us what the average time cycle would be for the same results with an inhibited wash of 20 minutes, with the same bath and the same conditions using depolarizers.

MR. IRWIN: I have some charts that were prepared by one of the steel mills for me and—this may or may not answer you—they report pickling time in seconds on a hot mill scale in baths of various acid concentrations and if we take it as they quote, "2½ pounds of acid a gallon, up on the high side there, that is less than 100 seconds to pickle that steel clean of scale." With a standard inhibitor in the bath it would take 130 seconds to pickle the same steel in that acid. That was a laboratory test. On a continuous pickler the difference between the accelerated type of bath and the inhibited type of bath, I don't know —except that since it is known that oxygen dies off in the acid in the inhibited bath and the accelerator will increase that acid as much as three times its normal activity. I anticipate with the type of chemical depolarizers we are now using and can control that we can accelerate that pickling time or decrease that pickling time by probably 20%.

MR. BILLINGSLEY: I was rather hoping you might have figures on a bath running an average rod mill for 10, 20 and 30 minute cycles.

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MR. IRWIN: On rod pickling one of our first mistakes was trying to do fast pickling; we got into mills where they couldn't handle it and in those mills where the normal pickling cycle was 20 minutes, we were able to put out rods consistently at 15 minutes using the same—or pretty much the same acid concentration — and the accelerator. You can get clean steel in about 25% less time.

MR. BILLINGSLEY: That is the measure of your efficiency and of your hydrogen evolution. It is not as big as one would tend to expect if it is only 25% or 30%.

MR. IRWIN: Along with that, 25% or 30% acid saving per ton over polarization practice; that is not bad.

A MEMBER: Would you tell me how to make Cuprodine?

MR. IRWIN: Do you really mean it or are you being facetious? Well, that is a product that is patented so it is all told in detail in the patent.

A MEMBER: But there are some things the patent does not tell. (Off the record discussion.)

MODERATOR DOVE: If we can now have a summing up: One thing that has come out of this discussion is that locality and water have an effect. The second thing that came out of the discussion is that each inhibitor has definite conditions under which it will give the best results; in many cases the manufacturer has thoroughly recommended those and often we don't follow their recommendations, either because we are wrong or because they are. The third thing is that we have a very definite problem to face in stream pollution. We do not have it to the degree that you folks do down in the States. The fourth thing is that there are points that we all have to look at both in inhibitors and accelerators; only time is going to tell—and the arguments that you will have after this meeting.

Thank you very much. The meeting is adjourned.

A Review of Recent Wire Patents

(*Continued from page* 809)

free of moisture and organic matter, having the following composition in percentages by weight: alkali metal nitrate 40 to 99.9 per cent; alkali metal nitrite 0 to 60 per cent; alkali metal oxide (containing at least 2 atoms of oxygen per molecule) 0.1 to 5.0 per cent.

★ ★ ★

No. 2,641,758, SPRING COIL FOR CUSHIONS, patented June 9, 1953 by David I. Levine, Swampscott, Mass., assignor to Spring Unit Development Co., Lynn, Mass., a partnership.

A double-cone coil is disclosed and differs from those shown in the inventor's prior patents 2,116,796 and 2,197,-131.

★ ★ ★

No. 2,641,778, SPRING CUSHION ASSEMBLY, patented June 16, 1953 by Aloysius J. Quinn, North Bergen, N. J.

Overlapping arcuate portions of adjacent helical wire springs provide interarc spaces, and pairs of special fastening tie wires are arranged to fasten the overlapping spring portions together.

★ ★ ★

No. 2,641,949, METAL STRING FOR MUSICAL INSTRUMENTS, patented June 16, 1953 by Povl Emanuel Jensen, Copenhagen, Valby, Denmark.

A metal tube is provided, composed of a number of steel wires tightly twisted about a central insert of softer material than that of the wires and the assembly constitutes the so-called string.

★ ★ ★

No. 2,642,098, MACHINE FOR MAKING WIRE FABRIC, patented June 16, 1953 by Albert L. Stoeckel, Euclid, Ohio, assignor to Wean Equipment Corporation, Euclid, Ohio, a corporation of Ohio.

Hexogonal mesh wire fabric may be fashioned by this machine. Special means is provided for forming slack in the wire being used in the manufacture of the mesh.

★ ★ ★

No. 2,642,125, SPRING CONSTRUCTION, patented June 16, 1953 by Clair S. Reed, Jackson, Mich., assignor to Reynolds Spring Company, Jackson, Mich., a corporation of Delaware.

A cushion seat is disclosed. Tension coil springs are connected between a frame and the rear portion of the structure, and cushion coil springs are supported upon the frame and define a resilient surface above the frame. There are also flat spring elements connected to the rear member and extending upwardly and forwardly into the surface of the upper coils and connected thereto to bridge the spacing between the tension coil springs and frame and the rear member above a toe clearance space defined between the frame and the rear member.

★ ★ ★

No. 2,642,537, APPARATUS FOR DETERMINING COATING THICKNESS, patented June 16, 1953 by Kenneth G. Carroll, Cranford. and Donald S. Miller, Westfield, N. J., assignors to United States Steel Corporation, a corporation of New Jersey.

Apparatus for determining the thickness of tin coating on a ferrous base sample is disclosed including an X-ray tube arranged to direct a primary X-ray beam on the ferrous base, a radiation detector arranged on the same side of the ferrous base for detecting iron fluorescent radiation, a device for rotating said support to change the angle between the detector and ferrous base independently of the X-ray tube, and a manganese filter between the detector and ferrous base.

★ ★ ★

No. 2,642,929, SEAT SPRING, patented June 23, 1953 by Maurice Stubnitz, Adrian, Mich., assignor to Stubnitz-Greene Spring Corporation, Adrian, Mich., a corporation of Michigan.

A double deck spring cushion is disclosed made up of two sections, one section overlying the other section, the upper section having in combination an

upper border frame and a number of longitudinal and cross rows of load-carrying short helical conical wire springs, the lower section having a number of spring wire stringers extending crosswise of the cushion under each cross row of load-carrying springs.

★ ★ ★

No. 2,642,930, SEAT BOTTOM SPRING, patented June 23, 1953 by Maurice Stubnitz, Adrian, Mich., assignor to Stubnitz-Greene Spring Corporation, Adrian, Mich., a corporation of Michigan.

This spring structure has a front base wire with turned back ends, a rear channel member slotted to provide rests, intermediate spring wire stringers with hanger portions at the rear received in the rests, two end stringers which have rear hanger portions with turned over ends, all the stringers at the front ends having jack spring portions with turned over ends clipped to the front base wire, transverse stringers intersecting the end and intermediate spring wire stringers, short coiled load-supporting springs having their lower ends interlaced with the intersecting wire stringers with the under intersecting wire over the wire of the bottom turn of the load-supporting spring and the over intersecting wire under the wire of the turn, an upper border frame secured to some of the top coils of the load-supporting springs.

★ ★ ★

No. 2,643,036, GARMENT HANGER, patented June 23, 1953 by Murray M. Schiffman, New York, N. Y.

A single-wire hanger is disclosed, with the wire of the cross bar flattened.

★ ★ ★

No. 2,643,285, APPARATUS FOR DETECTING DISCONTINUITIES IN WIRE, patented June 23, 1953 by Jesse A. Cranford, Buffalo, N. Y., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Apparatus for locating opens in insulated wire is described in this patent including a first energized coil to carry alternating current, a second coil in loosely coupled inductive relation to the first coil, an alarm associated with the second coil, a device for passing the wire to be tested in a looped path through the field of the first coil and an electrical device for reducing the impedance of the looped path.

★ ★ ★

No. 2,643,401, APPARATUS FOR MAKING SCREW FASTENERS, patented June 30, 1953 by Louis J. Lovisek, New York, N. Y., assignor to Parker-Kalon Corporation, New York, N. Y., a corporation of New York.

The apparatus includes a number of relatively shiftable die segments defining a screw blank-receiving cavity into which the screw blank is driven for forming a head on the screw blank, at least two of the die segments having opposed longitudinally extended screw blank-engaging faces provided with thread-rolling ribs and grooves to form threads on the screw blank after the screw blank has been headed.

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Haskell-Dawes Machine Co., Inc. 823
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National Research Co. 835
National Rubber Machinery Co. 813
New England Butt Company 841
New England Lacquer Co. 825
New England Wire Die Co. 840
Niehaus, K. A., Maschinenfabrik 821
Nilson Machine Co., A. H., The 825
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North Anson Reel Co. 841
Norton Co. 826
Nukem Products Corp. 842

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Pacific Coast Borax Company 823
Parkin Chemical Co., The 841
Pittsburgh Carbide Die Co. 840
Pittsburgh Steel Company 771
Platt Brothers & Co., The 842
Porter, H. K., Inc. 835
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Republic Steel Corp., Pressed Steel Div. 745
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Steel Equipment Co. 814
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Surface Combustion Corp. 841
Swift & Company 750
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Winchester Reel Co., Inc. 830
Wire Insulating Mach'y, Inc., Div. of Machinery Electrification, Inc. 810
Wire & Textile Machinery, Inc. 837
Wire Tool Div., Bridgeport Jig Boring Co. 836

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Youngstown Sheet & Tube Company, The 791

WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.
Only advertisers who have contracted for six or more insertions are listed in this section.

ABRASIVES—
Elgin National Watch Co., Abrasive Div., Elgin, Ill.
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ACID-PROOF CONSTRUCTION—
Ceilcote Company, Cleveland, Ohio
Chemical Construction Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio
Nukem Products Corporation, Buffalo, N. Y.

ANNEALING MACHINES — Electric Resistance
Syncro Machine Co., Perth Amboy, N. J.
Trauwood Engr. Co., Cleveland. O.

ANNEALING POTS AND BOXES—
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

BAKERS—(See OVENS—Rod Bakers)

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

BORAX—Wire Drawing
Pacific Coast Borax Co., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Prcvidence, R. I.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CARTONS—Paper
(See CONTAINERS—Paper, for nails, etc.)

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Metal & Thermit Corp., New York, N. Y.
Parkin Chemical Co., The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago.

CLEANING & PICKLING EQUIP.—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corporation, Newark, Del.
Holden, A. F., Company, The, Detroit, Mich.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

CLOTH—WIRE, All Metals
Chase Brass & Copper Co., Waterbury, Conn.
Roebling's, John A. Sons Corp., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Chicago.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Techema Co., Buffalo, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago.

COMPOUNDS—Extrusion, for Wire
(See Compounds—Vinyl)

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago.

COMPOUNDS—Vinyl, for Wire
Electronic Rubber Co., Stamford, Conn.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Pacific Coast Borax Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CORROSION PREVENTIVE PAPERS—
Angier Corporation, The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Manco Manufacturing Co., Bradley, Ill.
Porter, H. K. Inc., Somerville, Mass.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasive Div., Elgin. Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Industrial Diamond Powders, New Kensington, Pa.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Boulin, Victor J., Inc., New York, N. Y.
Danforth, The C. W. Co., Youngstown, Ohio
Industrial Diamond Powders, Inc., New Kensington, Pa.
National Research Co., St. Clair Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Carboloy Dept. of General Electric Co., Detroit.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation. Youngstown, Ohio
Nord International Corp., Denville, N. J.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rayaloy Carbide Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Carboloy Dept. of General Electric Co., Detroit
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Rayaloy Carbide Corp., New York, N. Y.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
Carboloy Dept. of General Electric Co., Detroit.
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rayaloy Carbide Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Evelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelly Wire Die Corp., New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Cochaud Wire Die Corp., New York, N. Y.
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rayaloy Carbide Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Murex, Ltd., Rainham, England
Rayaloy Carbide Corp., New York, N. Y.

DIES—Swaging
Murex, Ltd., Rainham, England
Rayaloy Carbide Corp., New York
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Continental Carbide Die Co., Lyndhurst, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS & TRAVERSES—Flange Steel
Entwistle, Jas. L. Co., Providence, R. I.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Metal Fatigue—Fatigue of Materials Laboratory, Princeton, N. J.
Wire Insulating and Rubber and Plastics Processing—Hale and Kullgren, Inc., Akron, Ohio
Zinc—Imhoff, Wallace G., Co., No. Highlands, Calif.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Harper Electric Furnace Corp., Buffalo, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Holden, A. F. Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Holden, A. F., Co., The, Detroit, Mich.
Morrison Industries, Cleveland, Ohio
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.
Holden, A. F., Co., The, Detroit, Mich.
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Holden, A. F., Co., The, Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

GUIDES—for Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

IMPREGNATING MATERIALS—
Solar Compounds Corporation, Linden, N. J.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Belding Heminway, New York, N. Y.
Electronic Rubber Co., Stamford, Conn.
Glass Fibers, Inc., Toledo, Ohio
Heineman Corp., Oscar, Chicago, Ill.
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.
Solar Compounds Corporation, Linden, N. J.
Solar Varnish Corp., Linden, N. J.

INSULATING MATERIALS — Paper—For Electric Wire Cable
Merrimac Paper Co., New York, N. Y.
Solar Compounds Corporation, Linden, N. J.
Solar Varnish Corp., Linden, N. J.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.
Solar Compounds Corporation, Linden, N. J.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

LUMBER—Wire Mill, Carload shipments for lagging and car blocking
Canada Reels, Ltd., Bury, Que., Canada
North Anson Reel Co., No. Anson, Me.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Bolts & Rivets
Meyer, Roth & Pastor Maschinenfabrik, Koln-Raderberg, Germany

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R.I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Chain Making
Meyer, Roth & Pastor Maschinenfabrik, Koln-Raderberg, Germany
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Closing Rope
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh.
American Insulating Mach'y Co., Phila., Pa.
Hale and Kulligren, Inc., Akron, Ohio
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Manco Manufacturing Co., Bradley, Ill.
Mettler Machine Tool, Inc., New Haven, Conn.
Porter, H. K., Inc., Somerville, Mass.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.

MACHINERY—Die Making
American Optical Co., Instrument Div., Buffalo, N. Y.
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
Nord International Corp., Denville, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio

MACHINERY—Extruding
Aetna-Standard Engineering Co., Pittsburgh.
Davis-Standard Sales Corp., Mystic, Conn.
Hale and Kullgren, Inc., Akron, Ohio
National Rubber Machinery Co., Akron, Ohio
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Malmedie Maschinenfabrik, Dusseldorf, Germany
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp. Cleveland, Ohio

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Lendt & Co., Inc., New York, N. Y.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Ets. Pourtier Frères, Romainville, France
Fidelity Machine Co., Inc., Philadelphia, Pa.
Hale and Kullgren, Inc., Akron, Ohio
National Rubber Machinery Co., Akron, Ohio
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R.I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Industrial Ovens, Inc., Cleveland, O.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Providence, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The, Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
Meyer, Roth & Pastor Maschinenfabrik, Koln-Raderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Optical, for Dies
American Optical Co., Instrument Div., Buffalo, N. Y.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Eng'g. Co., Youngstown, Ohio

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Hale and Kullgren, Inc., Akron, Ohio
Meyer, Roth & Pastor Maschinenfabrik, Koln-Raderberg, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.
Malmedie Maschinenfabrik, Dusseldorf, Germany
Wean Equipment Corp., Cleveland, O.

MACHINERY—Pre-Heater for Wire (for Extrusion of Plastics)
Industrial Ovens, Inc., Cleveland, Ohio
National Rubber Machinery Co., Akron, Ohio

MACHINERY—Re-Spoolers
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Davis Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Providence, R. I.
National Mach'y Exch. (Used), New York, N. Y.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
National Rubber Machinery Co., Akron, Ohio
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
Lendt & Co., Inc., New York, N. Y.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany.

MACHINERY—Straightening & Cutting
Kilmer, M. D., & Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Medart Co., The, St. Louis, Mo.
Mettler Machine Tool Co., New Haven, Conn.
Meyer, Roth & Pastor Maschinenfabrik, Koln-Raderberg, Germany
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Hughesville Machine & Tool Co., Hughesville, Pa.
Maillefer S. A., Renens-Lausanne, Switzerland.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Hale & Kullgren, Inc., Akron, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Marshall-Richards Machine Co., Ltd., Crook County, Durham, England
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Ets. Pourtier Frères, Romainville, France
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Hale & Kullgren, Inc., Akron, Ohio
Marshall-Richards Machine Co., Ltd., Crook County, Durham, England
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding (See WELDERS—Butt and Spot)

MACHINERY—Winding Wire
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L., Co., Providence, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Hale & Kullgren, Inc., Akron, Ohio
Herborn, Herborn, Germany
Marshall-Richards Machine Co., Ltd., Crook County, Durham, England
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
Kilmer, M. D., & Co., Cleveland, Ohio
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Angier Corporation, The, Framingham, Mass.
Lendt & Co., Inc., New York, N. Y.
Marshall-Richards Machine Co., Ltd., Crook County, Durham, England
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Wean Equipment Co., Cleveland, Ohio

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio
Morrison Industries, Cleveland, Ohio
Westinghouse Electric Corp., Industrial Heating Div., Meadville, Pa.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio
Morrison Industries, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Morrison Industries, Cleveland, Ohio

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio
Nukem Products Corporation, Buffalo, N. Y.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.
Solar Compounds Corp., Linden, N. J.

PAPER—Creped Wrapping
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS — (See COMPOUNDS — Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio
Nukem Products Corporation, Buffalo, N. Y.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRESSES—Hydraulic and Mechanical
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Hale & Kullgren, Inc., Akron, Ohio

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio

REEL AND TENSION STANDS—
Davis Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Providence, R. I.
Fidelity Machine Company, Inc., Philadelphia.
Industrial Ovens, Inc., Cleveland, Ohio
Kilmer, M. D., & Co., Cleveland, Ohio
Roll-A-Reel, Cincinnati, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

REEL CRUTCHES—
Roll-A-Reel, Cincinnati, Ohio

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Milton Machine Works, Inc., Milton, Pa.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Canada Reels, Ltd., Bury, Que., Canada
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
McCaskie, Inc., Wm., Westport, Mass.
North Anson Reel Co., No. Anson, Me.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Lavendier, Charles, Co., Inc., Pawtucket, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Winchester Reel Co., Ashuelot, N. H.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Canada Reels, Ltd., Bury, Que., Canada
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Lavendier, Charles, Co., Inc., Pawtucket, R. I.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
North Anson Reel Co., No. Anson, Me.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Winchester Reel Co., Ashuelot, N. H.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Canada Reels, Ltd., Bury, Que., Canada
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co., Pine River Minn.
Lavendier, Charles, Co., Inc., Pawtucket, R. I.
North Anson Reel Co., No. Anson, Me.
Winchester Reel Co., Ashuelot, N. H.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—(See Ovens—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana
Erie Iron & Supply Corp., Erie, Pa.
Gerber, J., & Co., Inc., New York, N. Y.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Company, Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SALTS—Heat Treating, Descaling, etc.
Holden, A F., Co., The, Detroit, Mich.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See Compounds—Wire Drawing)

SODIUM—for Descaling
Holden, A. F., Co., The, Detroit, Mich.

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Nukem Products Corporation, Buffalo, N. Y.

TESTERS — INSULATION (See MACHINERY—Spark Testers)

TESTING EQUIPMENT (See MACHINERY Testing, Physical)

TINNING PROCESS—
Metal & Thermit Corp., New York, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc. (See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TOOLS—Wire Cutting
Porter, H. K., Inc., Somerville, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Pressed Steel Div., Republic Steel Corp., Niles, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

TUBE BENDERS AND FORMERS—
Kilmer, M. D., & Co., Cleveland, Ohio

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—for Electric Wire
N. E. Lacquer Co., E. Providence, R. I.
Solar Varnish Corporation, Linden, N. J.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Worcester, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Malin & Co., The, Cleveland, Ohio
Seneca Wire & Manufacturing Co., Fostoria, O.

WIRE—Barbed
Gerber, J., & Co., Inc., New York, N. Y.
Interlocking Fence Co., Morton, Ill.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—Brush
Gerber, J., & Co., Inc., New York, N. Y.
Spencer Wire Corp., Union, N. J.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind
Erie Iron & Supply Corp., Erie, Pa.
Gerber, J., & Co., Inc., New York, N. Y.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Seneca Wire & Manufacturing Co., Fostoria, O.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Gerber, J., & Co., Inc., New York, N. Y.
Spencer Wire Corp., Union, N. J.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Gerber, J., & Co., Inc., New York, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Forming
Erie Iron & Supply Corp., Erie, Pa.
Pittsburgh Cut Wire Co., Pittsburgh, Pa.

WIRE—Galvanized
Erie Iron & Supply Corp., Erie, Pa.
Gerber, J., & Co., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Continental Steel Corp., Kokomo, Ind.
Gerber, J., & Co., New York, N. Y.
Johnson Steel & Wire Co., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Seneca Wire & Manufacturing Co., Fostoria, O.
Spencer Wire Corp., Union, N. J.
U. S. Steel Co., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Seneca Wire & Manufacturing Co., Fostoria, O.
Specialty Wire Co., Inc., Worcester, Mass.
Spencer Wire Corp., Union, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Special Shapes
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Erie Iron & Supply Corp., Erie, Pa.
Gerber, J., & Co., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Specialty Wire Co., Inc., Worcester, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
Specialty Wire Co., Inc., Worcester, Mass.

WIRE—Steel—Also Coppered and Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Erie Iron & Supply Corp., Erie, Pa.
Gerber, J., & Co., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Erie Iron & Supply Corp., Erie, Pa.
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WRAPPING PAPER—Creped (See PAPER—Creped Wrapping)

YARNS & TAPES—
Belding Heminway, New York, N. Y.
Glass Fibers, Inc., Toledo, Ohio

YARN TESTERS—
Heineman Corp., Oscar, Chicago, Ill.
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE
AND MASTICATING MACHINERY MANUFACTURERS

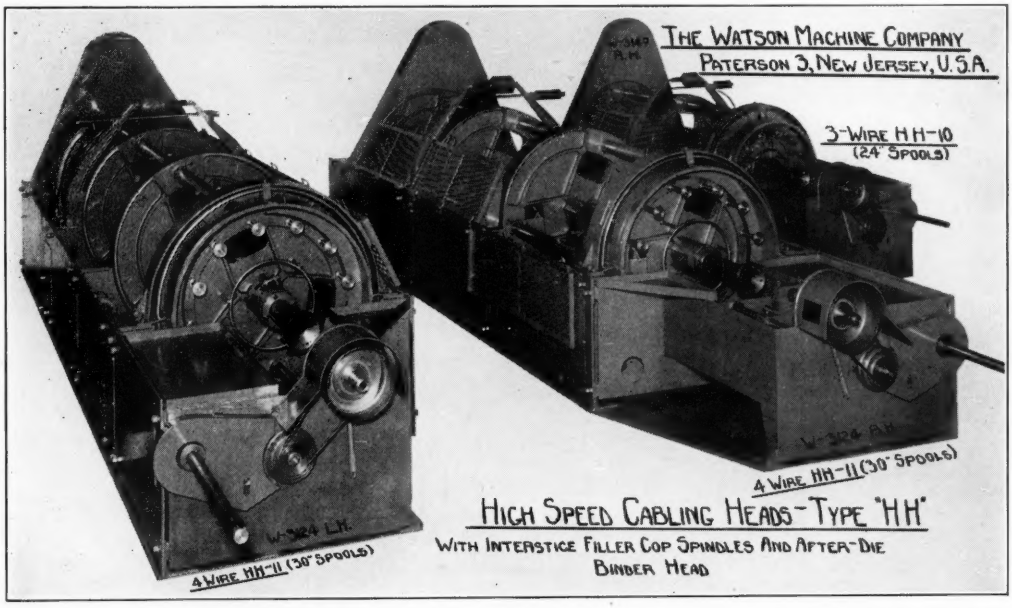
WATSON

HIGH SPEED CABLERS TYPE "HH"

THE OUTSTANDING ADVANTAGES OFFERED IN THIS DESIGN ARE HIGH SPEED AND FREE ACCESS TO ALL ADJUSTMENTS AND GUIDE POINTS WITH RESULTANT MAXIMUM PRODUCTIVITY.

"SHAFTLESS" NO LOOSE-PART PATENT BOAT CRADLES OR CONVENTIONAL CRADLES IF A VARIETY OF SPOOL SIZES IS TO BE LOADED. NYLON FRICTIONS, HANDWHEEL ADJUSTED.

ALL STEEL, CHROME MOLYBDENUM ALLOY AND BALL BEARING ROTOR. DIRECT VEE-BELT DRIVE TO ROTOR. RIGID ALL-STEEL BOX FRAME INSURES PERMANENT ALIGNMENT. AUTOMATIC SPRING-SET AIR-OFF BRAKES. QUIET PHENOLITIC SUPPORT ROLLERS ON ADJUSTABLE ECCENTRIC MOUNTS. GUIDES TO SUIT PRODUCT.


THE WATSON MACHINE COMPANY
PATERSON 3, NEW JERSEY, U.S.A.
3-WIRE HH-10
(24" SPOOLS)
4 WIRE HH-11 (30" SPOOLS)
4 WIRE HH-11 (30" SPOOLS)
HIGH SPEED CABLING HEADS - TYPE "HH"
WITH INTERSTICE FILLER COP SPINDLES AND AFTER-DIE BINDER HEAD

GUARDED FILLER COP MOUNTS AND MULTI-SPEED BINDER-SERVER AFTER DIE, IF SPECIFIED.

TWO-, THREE-, AND FOUR-WIRE CONSTRUCTIONS AVAILABLE IN THREE SIZES: FOR 24" x 14", 30" x 16", AND 40" x 20" SPOOLS. RIGHT OR LEFT HAND ASSEMBLIES.

* * * * *

CAPSTANS AND TAKEUPS TO COMPLETE THE MACHINES AVAILABLE IN MANY TYPES AND SIZES.

ATTENTION: USED MACHINES — EARLY DELIVERY

Eastern wire manufacturer will sell:

7-wire high speed stranders for 6" spools

8-strand high speed closers for 16" spools.

Fine wire drawing machines

All with 220-volt—3 phase—60-cycle electricals. Machines not our make, now producing. Contact us for plant visit arrangements.

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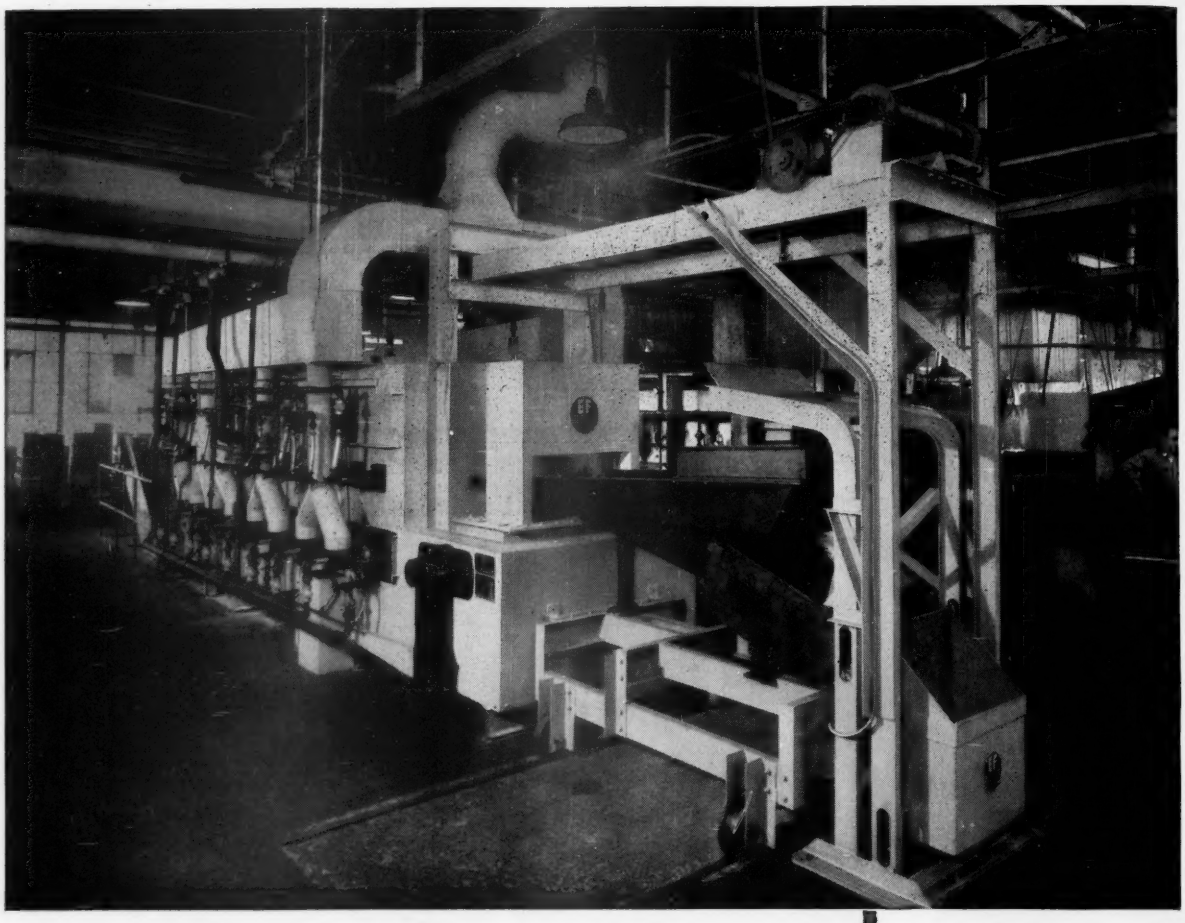

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Uniformly—Scale-free—Continuously, 175 to 2000 lbs. per hour

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